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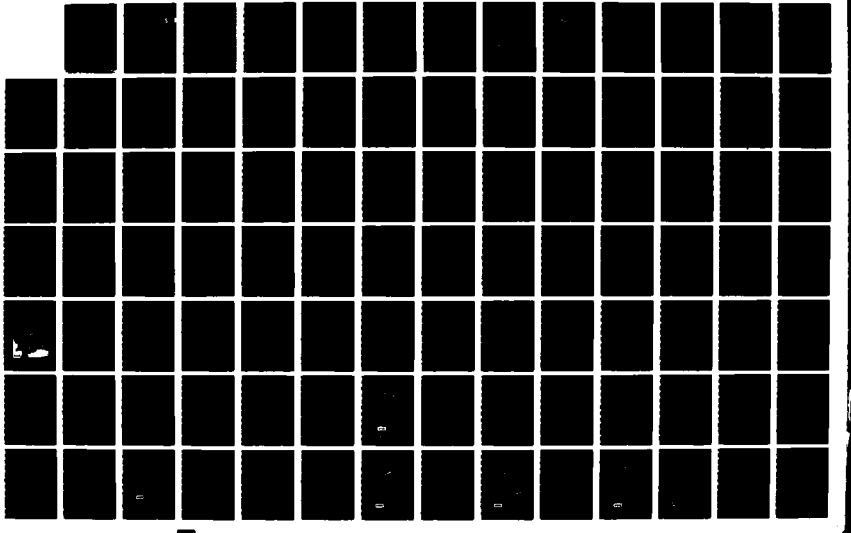

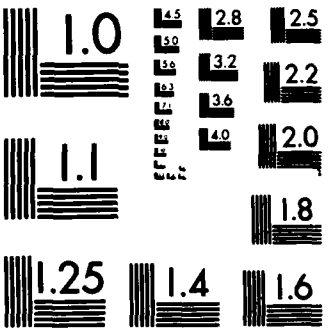

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THE WAVING OF FLAGS AND TORCHES: A STUDY OF TACTICAL COMMUNICATIONS IN THE SIGNAL CORPS DURING WORLD WAR I

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

RONALD W. VANDIVER, MAJ, USA
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THE WAVING OF FLAGS AND TORCHES: A Study Of Tactical Communications In The Signal Corps During World War I, by Major Ronald W. Vandiver, USA, 142 pages.

This study assesses the ability of the United States Army's Signal Corps to respond organizationally, technologically, and doctrinally to the changing tactical communication requirements dictated by the character of warfare existing in Europe both at America's entrance into declared war, and its subsequent campaign participations. The study focuses initially on an overview of the Signal Corps from the years of its birth to America's entrance into World War I. Futher investigative material is presented to establish the position that the American prewar attitude of non-involvement contributed to a position of general military unpreparedness, to include major impact's on the Signal Corps and its ability to respond to critical communication needs.

Examination of the Signal Corps' during mobilization highlights the difficulties of creating, and then sustaining, a technical force. The acquisition and training of personnel is the remarkable story of the struggle to meet the manpower requirements of the American Expeditionary Forces in France. A critical analysis of the employment of tactical communications in the Second Battle of the Marne and the Meuse-Argonne Offensive then provides the primary research focus for determing the communications equipment and personnel available to an infantry division in the American Expeditionary Forces; and to trace the changes in general doctrine, tactics and equipment as a result of its battle experience.

Research reveals that the Signal Corps' responded adequately to the requirements of providing a force capable of exercising the Army's signaling arm. However, being tested under the strain of combat extended the support capabilities of the tactical signal organizations to their breaking point. The ingenuity of the signal soldier ensured reliable, flexible and timely communications support, but at a great cost of manpower and material.

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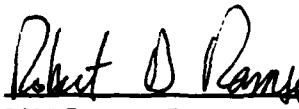
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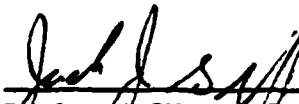
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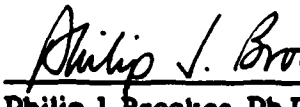
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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

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A STEP IN THE RIGHT DIRECTION: THE SIGNAL CORPS

> But I propose to communicate between detachments of troops marching or halted, warships at sea in motion or at rest, and messages in words or letters or figures given. The communications to be made without wires of any kind connecting the stations, without any stationary instruments or fixtures that will attract the interest of an enemy or that can be rendered useless by its fire, to be made with sufficient rapidity, to be made by day or by night, in wet or dry weather, in fog or in sunshine, to be made whether the signalmen are in view of each other or not, to be made over impassable ground, over rivers or arms of the sea.[1]

THE EARLY YEARS

On 1 October 1956, Dr. Albert J. Myer, destined to become the 'Father of the United States Army Signal Corps, wrote to Jefferson Davis, Secretary of War, sharing with him a vision. Myer realized the need to organize a separate signal organization for the Army that would pursue the development, and military application, of message sending techniques. The technology needed to create his vision had been available to the Army as early as the autumn of 1842, but an arm capable of exercising it was not. In 1856 the Army had the vocal powers of the commander and the sound of the bugler to issue orders and relay messages to the troops during battle. For its signal service outside the combat zone, it depended completely upon messengers, the post office and the twelve year old telegraph that had not yet crossed the Mississippi. The Army gave little consideration to

[1]This a direct quote from the letter Dr. Albert J. Myer wrote to Jefferson Davis as cited in David J. Marshall, The Story of the U.S. Army Signal Corps (New York. Franklin Watts, Inc., 1965), p. 5.

the challenge of troop control, but clearly did recognize that, "by giving greater speed - and greater range - and greater loudness - to his voice - of-command, the field commander was able to control a larger army."[2]

The newer signaling inventions of the present day were not suitable for the battlefield. The electric telegraph required wire, the mechanical semaphore was bulky and heavy, and the naval flaghoists were hardly useful to the highly mobile cavalry. For the first time, a light, simple and easily portable signaling system was available to the commander to send and receive information. Originally, Myer called it "flag telegraphy," and when he discovered torches facilitated night signaling, he added the title of "torch telegraphy." Finally, he used "aeriel telegraph" to include both systems and more importantly to differentiate his method from the electric telegraph. A general in the Civil War made use of the term "wig-wag" which became popular and stuck. Although this system's lifespan on the battlefield was relatively short, Myer's system is considered the starting point of modern tactical signaling.[3] Once the capability to transmit real-time information on the battlefield was gained, it would not be relinquished. The methods would change, but the waving of flags and torches would be seen again in different forms in the years ahead.

The making and harnessing of electricity in the middle of the nineteenth century resulted in the greatest progress in the exchange of information, and "heralded the beginnings of really modern warfare."[4] During the Civil War, for the first time in military history, actual orders and recommendations were exchanged almost as rapidly as they were spoken.

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[2]David L. Woods, A History of Tactical Communication Techniques (Orlando: Martin-Marietta Corporation, 1965), p. 75.

[3]Woods, p. 81.

[4]A.R. Borden, Jr., "A Study of the Development of Signal Communications in Military Tactics," The Signal Corps Bulletin 106 (October-December 1939), p 13

> At the close of the Civil War, the new Signal Service had completed the job of experimentation and the new organization of communications had changed from a toy and a vision to a reality. Sherman realized the value of rapid communications between elements in modern warfare and summed up the situation at the close of the war by saying, "The value of the magnetic telegraph in war cannot be exaggerated, as was illustrated by the perfect concert of action between our armies in Virginia and in Georgia in all of 1864. Hardly a day intervened when General Grant did not know the exact facts from me, more than 1,500 miles off as the wires ran."[5]

The period of peace and of minor engagements after the Civil War was one of great activity in the Signal Service. Utmost on the mind of BG Myer, Chief Signal Officer, was the survival of the Signal Service as an organization. Neither Congress nor the War Department was convinced of the need for a separate branch to fulfill the signal duties of a peacetime Army. The British and other European countries had long since made signaling a function of their engineers, therefore Congress was hesitant to create an independent Signal Corps for the American Army. However, General Myer's persistence paid off, and on 28 July 1866, the Armed Forces Act was passed by Congress. The act made permanent the position of Chief Signal Officer, but its language stopped short of creating the Signal Service as a separate organization. Instead it simply authorized the War Department to detail "for the performance of signal duty six officers and not more than one hundred enlisted men of the Corps of Engineers." Myer now took the liberty of reconstituting the Signal Corps. General Order No. 88, War Department, 22 October 1868, specifying the uniform to be worn by the

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[5]Ibid., p.15

enlisted men of the "acting Signal Corps," was the first War Department order to recognize the existence of even an "acting" Signal Corps.[6]

On 28 February 1870, Congress directed Myer by a joint resolution to establish, operate and maintain the country's first weather bureau. This had been Myer's idea. He was grasping for any mission that would keep the Signal Corps alive. The weather service fulfilled that requirement. It required the longline communications outside of the country's populated areas that were now being maintained by the Signal Corps. As the weather mission expanded, so could the supporting mission of providing interconnecting communications between the stations. The weather service grew until it was soon operating twenty-four hours a day, seven days a week. The Signal Corps found itself preoccupied with establishing weather stations, and publishing an average of thirty-five bulletins and sixty weather maps a day, a weekly Weather Chronicle and a twice weekly weather report called Synopsis and Probabilities.[7]

In 1873, Congress directed the War Department to construct and operate its own telegraph lines within the frontier. During the next ten years, the Signal Corps constructed eight thousand miles of pole line comprising three distinct and separate telegraph systems. Also in 1873, Congress directed the War Department to install a telegraph in every lighthouse and

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[6]June 21, 1860, is considered the birth date of the Army Signal Corps. On this date, Congress appropriated $2,000 for the purchase of signal equipment and created the position of Signal Officer on the Army Staff. Marshall in his book, The Story of the U.S. Army Signal Corps (p.15.), states, " The story has long been told that Myer was at once commissioned a major of Calvary and detailed to the Army staff for duty as signal officer. But the fact is that Myer was simply commissioned "signal officer with the rank of major"; and because he was the signal officer, he was *ipso facto* a member of the staff." As a signal officer, Myer was the head of a signal department that consisted of one person, himself. Not until October 1860, when Major Myer took command of a "volunteer detail of two officers and sixteen enlisted men" was the Signal Department functional. Marshall further states that this organization was not considered as a permanent organization, rather a "temporary training organization."

[7]Ibid., pp. 79-83

lifesaving station along America's Atlantic sea-coast, interconnecting them by wire while also providing for an interface with existing commercial lines. Because this also required a force to operate them, Congress passed the Act of 3 March 1875, two years later. Myer at last had from Congress the assurance that the Corps would continue to exist.[8]

Through the1870's, Myer retained his vision of supporting the commander in the field with mobile and reliable communication equipment and methods. He knew that flag signaling and the electric telegraph introduced a new dimension to the battlefield, and that tactics could never be the same. However, combat commanders and Congress were too slow to realize its potential in Myer's lifetime. Major communication improvements and unprecedented tactical communication developments had been secured at great personal sacrifice by Myer. Now it would be the responsibility of those remaining to hold his vision.

In 1887, Chief Signal Officer Adolphus Greely[9] began his administration by placing a "new and heavy emphasis on combat signaling." Like Myer, Greely was a visionary. However, his total budget could not even support one-fifth of the requests made by the combat arms for tactical signal equipment. Other challenges faced General Greely's Signal Corps as well. "The older officers of the army, steeped in conservatism, thought that electrical means of communications were not as good as the mounted messenger although every business man in the country was beginning to use the telephone." In 1890, Congress considered passing a bill that would abolish the Signal Corps. That bill failed to pass, but it did cause

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[8]Ibid., pp.85-86.

[9]In 1887, General Greely was appointed as Chief Signal Officer. The fact he was the ranking officer of the Signal Corps, combined with his "remarkable" Arctic service, made him the logical choice for the position.

movement to reorganize and redefine the Signal Corps mission. In 1891, that reorganization began with the transfer of the Weather Service to the Department of Agriculture. This was a stunning blow to the Signal Corps future existence since the weather service provided the Corps the majority of its budget and personnel resources. To survive, the Corps had to decrease its operational expenses while still providing a service to the country and her army. "Now he [Greely] took a strong line boldly. In the face of jibes, he plunged for telephones...."[10]

Installation of telephones where previously telegraph stations had been established enabled him to turn over hundreds of miles of telegraph lines the Signal Corps had operated and maintained for twenty years. This initiative provided that needed cost reduction. In the next few years, the Signal Corps installed for the Coast Guard Artillery the first telephones ever used for fire control, and established the Photographic Section of the Signal Corps. Trouble on the Mexican Border in 1893 provided the Corps with an opportunity to focus its interest on tactical communications once again.

Throughout the 1890's Greely strove to bring Myer's tactical communication's vision closer to a reality. He channeled the Corps' energy into exploring new information sending devices and methods. "Greely continued working assiduously on developing suitable electrical and visual communication equipment for the Signal Corps." Of particular significant was the development of the 'buzzer," a precursor of the radio telegraph. This signalling device sent high voltage electrical currents into a wire cable then into a telephone receiver at the distant end. He also developed a field telegraph train. During the Spanish American War and the Philippine

[10]Marshall, p.106.

campaigns, the field telegraph train was invaluable for it kept telephone and telegraph wires with troops as they advanced.[11] He also provided the first heliographs ever employed by the United States Army.[12] In 1898, he established the first balloon company in the history of the Signal Corps, and investigated the military value of heavier-than-air flying machines. The winning of the War Department's permission to employ balloons so military information could be collected visually or photographically sparked new interest for an Army Signal Corps. The war with Spain in 1898, granted the Corps the opportunity for expansion both in size and mission support on the field of battle.[13]

The part played by the Signal Corps in the Spanish-American War and the Philippines Insurrection was vastly larger than the restricted role of the Corps' signaling services during the Civil War. The Signal Corps provided telephone and telegraph wire lines and cable communications, as well as visual signals, notably the heliograph. This war tested many new tactical communication efforts of the Signal Corps, and was the first conflict to use telephones.[14] In the years immediately following, tactical communication equipment changed based on new experiments and new developments. Significant technological accomplishments and an emergence of a

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[11]General William Mitchell, General Greely: The Story of a Great American (New York: G.P. Putnam's Son, 1936), p.176.

[12]David L. Woods in his book, A History of Tactical Communication Techniques (p 156), states that "Heliography is the art of communicating between distance points in which the visible signals are obtained, by reflecting the rays of the sun by a mirror or combination of mirrors in the required direction. This is one of the most powerful signaling instruments where the sun shines and the atmosphere is free from obstructions such as haze, smoke and dust." The device for field signalling generally consisted of two tripods, two plain three and one-half inch circular mirrors, a sighting rod, a horizontal tangent screw, and a cylindrical handle connected by a ball and socket joint with a lever attached to the revolving plate carrying the stationary mirror, so that the lever handle and the rod together formed a finger key.

[13]Marshall, pp. 106-109, 136.

[14]Ibid., p. 141

science of electronics opened the door to the creation of a new generation of communication transmission means. After the telegraph came the telephone, and then the wireless. Before the close of April 1899, the Signal Corps was operating the first successful wireless-telegraph system ever placed in service in America. However, tactically, the opportunity to employ electrical communication devices was still limited, primarily because the need to use it in the Army's field units did not yet exist.

THE PREWAR YEARS

The old methods employed in ground signaling fulfilled the requirements of an Army engaged in small-scale maneuvers or patrolling the Mexican Border. Quenched-spark sets transported by pack or wagon introduced radio into field maneuvers.[15] However, buzzers, messengers and visual signaling provided the required command and control communications to the Army. In fact, only visual signaling counted for much in the field. Although the field artillery had had telephones for fire control since 1905, it used flags more often as its primary means of communications. The telephone gave no promise of sturdy tactical military use in the immediate future and telegraph trains, increased in size to nine wagons, were still rear-echelon communications. Although Lee de Forest patented the three-electron vacuum tube in 1906, and its amplifying circuit in1907, the Signal Corps did not pursue its potential for vast improvements to existing portable and fixed radio sets. Vacuum tubes were used for receiving and amplifying purposes, but not considered for transmitting purposes. In fact,

[15]George R. Thompson, "U.S.Army Radiotelephone in World War I," Signal, (June 1962), p.81. When the U.S. Army went to war in 1917, the Signal Corps was providing only two radio types for field use. Both were large high-powered quenched sparks transmitters. These were so called Pack radio sets (SRC-49), which could be broken down into several components for transport by two or three Army mules, and a still larger Motor Truck, or Tractor, Set (SRC-50).

production of the vacuum tube in America did not begin outside commercial laboratories until entrance into World War I.[16]

In subsequent years, various signal officers developed proposals for future improvements in communication methods. In 1909, Signal Corps Captain William Mitchell presented a "Lecture on Field Signal Communications" at the United States Army Infantry and Cavalry School. This lecture included proposed equipment and corresponding employment changes, and recommended the adoption of tactical communications equipment being used by the German Army and other European countries.[17] Soon afterwards, the Signal Corps adopted a German- made radio for use in the field. and experimented with communication devices from other countries.

In 1914, there was war in Europe. A war that, at that moment in time, had no direct application for the United States Army Signal Corps. In 1915, when American involvement in the war seemed to be more a possibility, BG George Scriven, Chief Signal Officer, prepared Circular No. 8, Service of Information. He wrote that any officer about to assume command of an army or expeditionary force in a foreign country would not willingly lack information on the types of communications sytems required to transmit information effectively and efficiently in the new theater of operations. To acquire that knowledge, the commander must trust the signal officer to determine, based on the nature of the country and the probable scope of operations, the details of what lines of communications to establish and the type of signaling devices to use. Conscious of the events abroad, BG Scriven addressed in broad terms the impact of electricity on the conduct and control of battle, and outlined the capabilities and

[16]Dulany Terrett, The Signal Corps: The Emergency (Washington, D.C.: Government Printing Office, 1956), pp. 16-19.
[17]Woods, p.124.

functions of the services of information in the armies of foreign nations. Unfortunately, his information was sketchy. His use of the phrases "though not yet fully known in detail" and "not until long after the present war is ended will a full knowledge of these and other marvelous developments be known," exposed a significant obstacle to the Signal Corps' ability to pursue the development of communications suitable for an european style of warfare. America was neutral, still at 'peace'. Thus, detailed information from any of the belligerents pertaining to technological developments was non-existent, or incomplete at best.[18]

Therefore, the Signal Corps' inability to visualize and/or understand the conditions resulting from the character of warfare being created during the years of their non-participation in this Great War contributed significantly to a state of unpreparedness upon their entry . Providing and maintaining communication support in this war was essentially, and inevitably, a process of improvisation. Survival on the battlefield mandated adaptation of communication means previously dismissed by the belligerents. Radio, considered an unreliable means of transmitting information on the battlefield in 1914 evolved into an integral part of influencing the control of battle during movement by 1917. Wire communications, specifically the telephone, now replaced visual signalling devices and methods.

By the time America entered the war, communications equipment developed by the French and British fulfilled the communication requirements of their armies in the trenches. Although not the primary means of transmitting information, the radio received much attention by all the belligerents. Small tube radio sets with resulting maximum selectivity and

[18]George P. Scriven, The Service Of Information United States Army (Washington, D.C., Government Printing Office, 1915), pp. 37-38.

power designed to operate at ranges mandated by close stationary warfare were now common items in their armies. Radios in the American Army were not of this type. America's Signal Corps focused its development on long-range radio work sets with a normal range of 250 miles overland and as much as 800 miles over water. In Circular No. 8, BG Scriven stated that the four types of radio in use by, or under construction of, the Signal Corps were "quite equal to any elsewhere existing." That was true, but none of the four being developed were suitable for the trenches. The Signal Corps had not remained inactive during the period 1914-1916, its tactical communication requirements simply were not focused on fighting a war in France.[19] Michael Howard's Chesney Memorial Gold Medal Lecture entitled "Military Science in an Age of Peace," places in focus the dilemma faced by the Signal Corps during the years immediately before America's transition *from peacetime.*

> A soldier...in peacetime is like a sailor navigating by dead reckoning. You have left the terra firma of the last war and are extrapolating from the experiences of that war. The greater the distance from the last war, the greater become the chances of error in this extrapolation. Occasionally there is a break in the clouds; a small conflict occurs somewhere and gives you a "fix" by showing whether certain weapons and techniques are effective or not; but it is always a doubtful fix....For the most part you have to sail on in a fog of peace until at the last moment. Then, probably when it is to late, the clouds lift and there is land immediately ahead; breakers, probably, and rocks....Such are the problems presented by " an age of peace." [20]

Thus, the Signal Corps, like the rest of America, was indeed not ready for war. Yet, the Signal Corps' lack of preparedness for the war cannot be solely based on the 'fog of peace' or an inability to obtain information from the active participants in the Great War prior to 1917. In 1914, the

[19]J.G.Harbord, "Radio In War," The Signal Corps Bulletin 77 (March-April 1934), p.31.
[20]Michael Howard, "Military Science in an Age of Peace," Journal of the Royal United Services Institute for Defense Studies, March (1974), p. 4.

conflict in Europe evoked the sympathy of many American leaders and a segment of the general public, but for most the war was too far removed from America to warrant attention. None of the warring powers had seriously challenged America's position of neutrality, and the ability of any enemy forces to threaten American security from the other side of the world was considered remote. The leaders of America believed that in the unlikely event America was confronted with a situation warranting a military response, such responses as were necessary would be established. T. Harry Williams in The History of American Wars states that this prevailing estimate was realistic up to a point. America's military forces were competent to defend against a second or third rate power, but could not have sustained an offensive operation against any major power. Compared to the 100,000 American troops authorized for the regular army, France had 1.5 million troops and Germany had 2 million available in 1914. In addition, command arrangements in the highest level of the military were inadequate for conducting a major war. Command personnel were quantitatively inadequate for exercising effective control of, or plan for, possible wars. The General Staff, as a result of the War Department bureaus' intervention, had been reduced by congressional legislation in1912 to thirty-six, a far cry from the hundreds manning the staffs of major European powers.[21]

The state of the military force structure caused little alarm among America's leaders until 1915. In that year, for the first time, America recognized, based on the successes of Germany's submarine campaign, the possibility of a German victory. In 1916, President Wilson won on the

[21]T. Harry Williams, The History of American Wars, (New York: Alfred A. Knopf,Inc., 1981), pp. 352-389

platform, "He kept us out of war," but he now turned to consider whether or not the nation was prepared to fight a major power. Late in 1915, the General Staff had submitted to the War Department a study entitled "A Proper Military Policy for the United States," proposing a plan to defend America with a citizen army. This plan, modified by the President, resulted in the National Defense Act of 1916. Unfortunately,

> ...the act was deficient and unrealistic. It should have been obvious,from even the rudimentary planning, that the place to defeat Germany was in Europe, that the United States would have to dispatch a force abroad to fight with allies - while it still has allies. But none of the persons concerned with planning-the President, his advisors or the General Staff- grasped this conclusion; they all assumed that the United States should prepare to act alone in defending against a German attack. And this was all the National Defense Act was designed to do, to provide a force capable of repelling an attack on the eastern seaboard. The reasoning that went *into* the act was hardly comprehensive.[22]

After the passage of this legislation in 1916, the Wilson administration, though it had begun the preparation process for America's defense, went no further. In fact, the president openly resisted efforts in planning for war. On one occassion when he was informed that war plans were being devised by the General Staff, he went "white with passion," and stated that such exercises should stop. The military, now, in isolation, attempted to develop a military strategy that was in concert with America's foreign policy. Excerpts from an address given to the New York Society of Military and Naval Officers of the World War on 5 December1933, by Major General J. Harbord, Chairman of the Board, Radio Corporation of America, addressed the impact of not having a coordinated military policy in regards to maintaining a technological balance with other major powers.

> With the inventive genius of our (U.S.) people the extent to which invention and manufacture are in this country preceded by re-

[22]Ibid., p. 380.

> search, and the capital available for investment in such things, it was to be expected that America would not lag in the adoption of the most modern devices for its national defense. The officers of our Army and Navy have always striven for the latest word in equipment and armament. Our Government... is , however, peculiarly susceptible to the influence of organized minorities ...(the organized minories) have long prevented our country from having any very steady or consistent military policy.... The Great War, like all its predecessors, found us unprepared even in things where in a commercial sense we led the world.[23]

The Signal Corps had maintained a technical engineering staff responsible for the development and improvement of communication apparatus used by the Army. No piece of equipment was adopted or put under production until it had the approval of The Chief Signal Officer through the Engineering Division. However, modernization of the Signal Corps was not a peacetime priority. Without a foreign or military policy that considered intervention overseas, technological upgrades in communication apparatus in 1916 were extremely doubtful. Any modernization of equipment or organizational changes to the Signal Corps would be based on the communication requirements for the Punitive Expedition. Unfortunately, the character of warfare existing in Mexico was completely opposite of that in Europe.

The lines of communication provided by the Signal Corps during the Punitive Expedition consisted only of telegraph service along the Line of Communication, supplemented by radio as the alternate means. In order to fulfill these requirements, the Signal Corps assembled several different field stations that were already in operation along the border. No combat field wire lines were laid nor were any messages transmitted by visual

[23]Harbord, pp. 27-28

signaling. During this period, aeroplanes were used in active service for the first time in the history of the United States Army.[24]

In the year 1917, BG C. McK. Saltzman, Acting Chief Signal Officer, stated that the Signal Corps met its requirements to support the Punitive Expedition with "some difficulty." [25] MG John J. Pershing in his official report on the Punitive Expedition, shed light on the state of the Signal Corps upon completion of its committment. The Signal Corps was initially without field wire to support the movement of troops between Columbus, New Mexico and Mexico. Radio communications proved unsatisfactory because: the radio equipment used had been in continuous service without opportunity for rebuild prior to its commitment, and repair part availability was nonexistent for those German manufactured sets. In addition, a lack of appreciation for the limitations of the pack radio sets existed. Eight unserviceable aeroplanes constituted the equipment authorization for the Punitive Expedition's squadron. The organization of the squadron itself was "very imperfect and incomplete." [26]

Recognizing a need for improvements, Signal Corps appropriations and personnel authorizations measurably increased after several months. Specifically, appropriations for the air service increased tenfold and additional increases in the Reserve Corps' personnel strengths were authorized. In addition, the Corps was given the authority to proceed with the organization of units and the purchase of equipment to meet existing needs.[27]

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[24]Excerpts from Report by Major General John J. Pershing of the Punitive Expedition dated October 10,1916, pp. 43-44. (Typewritten).

[25]War Department, "Report of The Chief Signal Officer," War Department Annual Reports, 1917, 3 vols. (Washington, D.C.: Government Printing Office, 1918), I, p. 837

[26]Pershing, p.44.

[27]Ibid.

Meanwhile America's involvement in the European war seemed more certain everyday

THE CHALLENGES OF WAR

On 2 April 1917, President Wilson went before Congress and asked for a declaration of war. In his address he declared his intentions to raise and dispatch to Europe a large ground force. The government had finally announced a military strategy, but to organize and equip such a force as envisioned by President Wilson would demand an effort unlike any that came before.[28]

The challenge confronting the Signal Corps would now be to provide, in the shortest time possible, communications support that would extend from the training camp to the frontline trenches. The Corps was inadequate in both equipment and manpower to struggle with the task at hand. Compounding the situation, only a handful of qualified officers were available to plan the communications system and to pursue the acquisition of the tactical communication equipment needed immediately.[29]

When the first elements of the American Expeditionary Forces arrived in France in the spring of 1917, they would be brought face-to-face with the reality of modern warfare. Above all else, this war had become an engineering operation in which every branch of scientific research was being used to bring about the defeat of Germany. In no branch of the Army was up-to-date technical knowledge more necessary than the Signal Corps, yet the opportunity to prepare for the war in time of peace had not been allowed. Not only the allies, but the enemy, had adapted to signaling

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[28]Williams, p.382.

[29]War Department, Office of the Chief Signal Officer, Report Of the Chief Signal Officer To The Secretary Of War 1919 (Washington, D.C.: Government Printing Office, 1919), pp 6-7

the latest products of science. Three years of intensive wartime development and experience resulted in major improvements to the communications equipment of all the belligerents. To combat the enemy's achievements the AEF had only limited tactical communications resources which, though suited for operations such as might be expected by America, were not adapted to the conditions prevalent in the European War. It had been the same for the British upon their entrance into the war in 1914.

> It was in signal pratice in the field that great changes took place. The original B.E.F. had been trained to rely for all intercommunication on the telegraph (air-line and cable), "visual", liaison officers, despatch riders and orderlies. The conditions of stationary warfare brought about the almost complete disappearance of "visual" and the general introduction of the telephone. The vulnerability of cables and air lines under ever increasing intensity of shelling brought about in 1915 the burying of cables in trenches.... Thus 1915 was the period of the evolution of alternate means of signalling, and the early part of 1916 the period of experimenting with the combination of these means.[30]

The Signal Corps had fulfilled its responsibility in years past, but now faced unprecedented challenges. Expansion of the Signal Corps marked a dividing point in its history. Transition from a "band of individual experimenters" that had not had the time to "solidify their experience and call it doctrine" to a large organization that "took on a corporate existence of its own matched by corporate control" occurred practically overnight.[31]

Relentlessly spurred by a moving technology, the Signal Corps underwent a rapid and drastic revolution in organization for combat, tactical communication doctrine and employment of new signaling apparatus. "In a race against the time-clock of pressing necessity" the Signal Corps in1917

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[30]Great Britian, Committee of Imperial Defense, Military Operations, France and Belgium, 1916, 3 vols. (London: MacMillan, 1933), I, p. 68.

[31]Marshall, p. 145.

began its struggle to respond to the communication requirements of an America at war.[32]

PROBLEM STATEMENT AND RESEARCH QUESTIONS

Such was the Signal Corps entrance into the Great War. This study now examines the Signal Corps during the period of April 1917 until the signing of the armistice. Given that the American attitude of the times contributed to a position of general military unpreparedness for entry into World War I, this study is to assess the Signal Corps' ability to respond organizationally, technologically, and doctrinally to the tactical communication requirements dictated by the character of warfare existing in Europe both at America's entrance into declared war, and its subsequent campaign participations. The results of this assessment are based on answering two primary questions. First, how well did the Signal Corps respond in providing trained signal technicians to the Army; secondly, how well did it respond to meeting the changing tactical communication requirements of the American Expeditionary Forces in France.

DELIMITATIONS

This study is not an assessment of the Signal Corps' ability to conduct its general coast defense mission in the United States or its weather and photography service mission for the Army. Discussion on the development of the aeroplane and balloon is limited to their role as a tactical communications medium during the period the Signal Corps was assigned the responsibility for aviation. A critical analysis of the employment of tactical communications by selected units in the Second Battle of the Marne and the Meuse-Argonne Offensive provide a research focus in determining the

[32]Ibid., p. 225

communication equipment (agencies) and personnel available to the infantry division, and in tracing the changes in general doctrine, tactics and techniques as a result of battle experience. Training and initial mobilization will be addressed from a Signal Corps perspective.

DEFINITION OF TERMS

For the purpose of this study four terms need definitions. They are "communications," "tactical communications," "signaling," and "agencies of communications."

Communications- The definition adopted for this study is that of David L.Woods, book, A History of Tactical Communication Techniques: "One man sending a mesage to another man, by any means.

Tactical Communications-The definition adopted for this study is that of Rex D. Minckler from the Encyclopedia Americana: "Long range military communications from the seat of government or from key forces and agencies not located upon the battlefield may be referred to as strategic military communications, whereas those military communications employed on the battlefield may be referred to as tactical military communications."[33]

Signaling-The term is interchangeable with "Communications."

Agencies of communications- A term used initially by the British, and subsequently used in many of American Army training pamplets for the term "means of communications."

[33]Rex D. Minckler, Encyclopedia Americana (New York: Americana Corporation, 1961), p. 234.

SIGNIFICANCE OF THE STUDY

> The military student does not seek to learn from history the minutiae of method and technique. In every age these are decisively influenced by the characteristics of weapons currently available and by the means at hand for maneuvering, supplying, and controlling combat forces. But research does bring to light those fundamental principles, and their combinations and applications, which, in the past, have been productive of success. These principles know no limitation of time. Consequently, the Army extends its analytical interest to the dust-buried accounts of wars long past as well as to those still reeking with the scent of battle. It is the object of the search that dictates the field for its pursuit.[34]

The study of World War I offers the military professional valuable lessons that are both unique to that time, yet applicable to any warfare. Lying in the shadow of World War II, its value for study is slighted both by military historians and the service schools. Few works deal with specific World War I American battles and no official narrative histories of the war exist.[35] Yet, it is World War I that provides us specific lessons on how a nation, unprepared for the character of warfare existing in Europe, could so quickly mobilize, train and participate in a world war. It is this war that first reinforces the role politics, economics and society have in shaping the magnitude and character of war. But, before we can assess the significance of this study on the World War I Signal Corps, a different question must be answered: What is the value of studying history to a military officer today? In answering this question, the primary question will in fact be addressed.

The results of critical analysis and the assessment of history can enhance the battlefield performance of today's professional officer in war. The officer corps today consists largely of men and women who have not

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[34]General Douglas MacArthur, Report of the Chief of Staff U.S.Army, 1935 (Washington, D.C.: Government Printing Office, 1935), p. 32, as cited in A Guide to the Study and Use of Military History.

[35]John E. Jessup, Jr. and Robert W. Coakley, A Guide to the Study and Use of Military History (Washington, D.C.: Government Printing Office, 1979), pp. 225-230.

experienced war first hand. To fully understand the depth and breadth of warfare, we must depend upon others. Through the words of military historians and critics who have either experienced war, or studied it, the complexities of the battlefield are made evident. Therefore, the application of historical research complements current military thought, and completes the visualization of the battlefield.

The past is not the sole ingredient upon which the future is predicted, but it is an essential element when considering the possibility of the same events or reactions occuring in the future. Proper analysis of the 'what might be' is possible only if the correct facts are known. The study of history assists that process by putting into context events which may provide insight, or meaning, to what might otherwise not be apparent. The greater, and more frequent, the exposure to historical writings pertaining to the events surrounding war, the greater the opportunity for understanding. And more importantly, the increased liklihood of not repeating the mistakes of the past.

History can be viewed as a means to an end, and that 'end' is the assimilation of knowledge for future use. The foundation, the basis, for sound decision-making on the next field of battle will be enhanced by understanding of the past. The study of history allows the professional officer to take advantage of 20-20 hindsight. The History of Communications-Electronics in the United States Navy, opens with this quotation from George Santayana, "Men who ignore the past are doomed to relive it." The opportunity to make the right decision on the battlefield may come only once.

There are four basic truths, in my opinion, that remain constant for all warfare. First, very little is really new. Secondly, change is generally resisted because it eliminates something that is considered irreplaceable.

Third, men often fail to understand changing technology and its resulting developments. Fourth, the human aspect of war remains the same. Certainly, these truths ring clear when applied to the study of all the past wars in which America has participated.

In addition, there are fundamental principles that remain timeless. Regardless of the nature of the conflict, or the armies participating, some things do not change. From a political perspective, actions of government will always affect the conduct of warfare; and human relationships, governed by the social make-up of the waring nations, will dominate its character. It is the responsibility of professional officers to study them in depth, and to assess how these basic principles affected not only past wars, but their probable impact on tomorrow's character of warfare. However, even more basic is simply to recognize history's educational and professional value.

In this war, men seemed to be nothing less than a commodity that was acquired, distributed, expended and replaced. The daily occurrence of death and destruction hardened and conditioned responses to accomodate the "hell" they endured. What was once considered normal quickly lost its perspective, and war shaped the normalcy of life. It is easy to visualize the battlefield as men entangled in a great war machine. John Keegan in The Face Of Battle states, "Impersonality, coercion, deliberate cruelty, all deployed on a rising scale, make the fitness of modern man to sustain the stress of battle increasingly doubtful."[36] The lessons of controlling the effects of stress on the battlefield appear to have been lost today. Stress management is but one of the many areas of study woefully needed in the critical analysis of past wars. The commander without communications, or

[36] John Keegan, The Face Of Battle (Great Britain: Jonathan Cape Ltd, 1976), p 331

the signal soldier responsible for its installation knows too well the impact of stress on their performance.

From a positive perspective, the study of World War I displays the individual soldier's ability to overcome obstacles and hardships. Their courage provides a reference point for others who will face similiar circumstances in future battles. If they survived, so can we. That survival will be enhanced by knowing what has been attempted, and the reasons for its success or failure. Michael Howard's Chesney Memorial Gold Medal Lecture entitled "Military Science in an Age of Peace," introduces the term "fog of peace." That fog is created as the result of military professionals' inability to extract and analyze historical military experiences. Certainly technology does change things , but objective application of lessons learned will decrease the 'friction of war.' That translates into less confusion on the battlefield. If the following quote is true, then a need for historical examples in order to ensure we have the collective wisdom of many to keep us on the proper course and from error.

> A soldier...in peacetime is like a sailor navigating by dead reckoning. You have left the terra firma of the last war and are extrapolating from the experiences of that war. The greater the distance from the last war, the greater the chances of error in this extrapolation.[37]

Today's assumptions concerning new tactical communication center on employment of "state of the art" devices. Yet the heart of modern tactical communications may prove to be a surprise. Without warning, tactical communications have a way of reverting back to past methods of information processing or message transmissions. For example, after the successful military adoption of the electric telegraph on the battlefield, the simple

[37]Howard, p.4

heliograph returned with greater success.[38] The lessons learned by the World War I Signal Corps may play into the next conflict to an extent greater than we can imagine. Raising, training and sustaining a technical force will be no less difficult. Neither will be the employment of evolving doctrine based on revoluntionary changes in technology. The gravity of the next battlefield demands that when we engage the enemy, we are successful the first time. The ability to provide timely and effective command and control communications will be an essential ingredient for that success. There will be no margin for error. Thus, the Signal Corps must ensure it is prepared to support the battle - for the opportunity may come only once.

SUMMARY

Little is written about the stuggles of the Signal Corps during the Great War. Historical research in tactical communications is generally uncommon. This thesis has the obvious limitations inherent in attempting to reconstruct events from varied sources many years after they occurred. Yet, it will add to the depth of knowledge. It is a piece of the tapestry whose threads provide the continuity of those timeless principles of war. It reinforces the trends that have developed over hundreds of years, and without deliberate and detailed study will result in a significant loss of valuable lessons learned. Chapter Two examines the World War I Signal Corps' ability to raise, train and sustain a technical force responsive to the American Expeditionary Forces in France. Chapter Three and Four then assess how effectively the tactical signal organizations responded to meeting the communication requirements of the AEF both in the defense and offense. Finally, Chapter Five presents both the conclusions and future application of the study.

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[38]Woods, p. 258.

CHAPTER TWO

SIGNAL SOLDIERS IN THE MAKING: Wartime Selection, Training and Replacement of Signal Corps Personnel

> The commodities of war are men and material-the first or most important commodity is men. A condition of war presupposes that the entire manpower of a nation is available to its purpose. It is a commodity in finished form. Research and inquiry into the conduct of war are predicated on no shortage of manpower, rather it is concentrated on the science of the specialized use of the first commodity of war effort. The study of a plan for war, then, becomes one of the effective uses of manpower and of the proporting of men and material in relation to the war effort; to train men, equip them, and put them into motion in conformity with plan.[1]

BACKGROUND

The acquisition and training of personnel for the Signal Corps is the remarkable story of the struggle to meet manpower requirements of the Army in France and in the United States. The National Defense Act of 1916 established a basic formula for the creation of a citizen army. The creation of the Council of National Defense united the Government and the American people into a single agency working together for the common defense. However, America entered the war before the slow machinery of government could affect significant improvement in the manning of the Army, particularly the Signal Corps.[2]

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[1] James B. Bogman, "The Influence of Economic Control Agencies on the Conduct of War" (Individual Research Study, Command and General Staff College, 1935), pp.5-6.

[2] Frank W. Bullock, "Wire Industry Vital to Industrial War Planning," The Signal Corps Bulletin 66 (May-June 1932), pp. 1-3

In the 1916 Report of the Chief Signal Officer, BG Scriven stated the importance of this act to the Signal Corps. However, he felt it necessary to prefaced his remarks. His concern was that the retirement of experienced officers, combined with a reduction in the trained noncommissioned corps, had degraded the Signal Corps' technical and professional arm's ability to support the Army at large. The system of detailing officers from the line for periods of service in the Corps could no longer provide the technical leadership needed by a corps of specialists. The National Defense Act of 1916 was viewed by the Office of the Chief Signal Officer as a step in the right direction.

> The Signal Corps has long been handicapped in the proper performance of its duties by the lack of an adequate personnel. This situation has, however, been partially relieved by increases in men and officers of the corps under the National Defense Act of June 3, 1916....Among the most important sections of the National Defense Act are those authorizing the organization of the Officer's Reserve Corps and the Enlisted Reserve Corps...it is believed a large body of experienced technical men can be organized and trained in times of peace and be available for service in times of need.[3]

In the expansion of the American Army immediately after the declaration of war and in the nineteen months following, "no branch was increased in so great a proportion as the Signal Corps."[4] The Army of 1916 had no overhead tactical organization. As a result signal communications had not been fully developed. Thus, the proportion of signal troops for intercommunications within the higher units was much below the proper proportion of the strength of the Army. The experience of the wartime British and the Germans had shown that their Signal Corps had increased

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[3]George P. Scriven, "Report of the Chief Signal Officer," War Department Annual Reports, 1916, 3 vols. (Washington, D.C.; Government Printing Office, 1916),I, pp. 860, 864.

[4]Ibid., p. 11.

not only in actual numbers but in relative strength as compared with their wartime armies.[5]

The first survey made by America's Chief Signal Officer, and then by the signal officers who accompanied General Pershing to France, concluded that the Signal Corps must, as a minimum, tailor its signal organization after that of its allies. The character of warfare existing in Europe required a greater multiplicity of communications means and a greater perfection of each. Not only had methods and equipment in the allies' signal services advanced since1914, but special services had been introduced into their organizations which had never been formed as a part of the American Signal Corps, nor represented in any branch of our Army. Personnel with the skills to maintain and operate new equipment, and to provide communications support for both open and trench warfare, were now needed . These would include, among others, the following personnel categories:[6]

Telephone and telegraph engineers
Traffic and plant experts
Telephone Operators, both male and female, speaking French, German and English
Telephone Installers and maintenance experts
Telephone and telegraph repeater experts
Printing telegraph mechanics
Traffic supervisors and testboard men
Traffic and wire chiefs
Linemen

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[5]Paul W. Evans, "Strategic Signal Communications-A Study of Signal Communications As Applied To Large Field Forces, Based Upon The Operations Of The German Signal Corps During The March On Paris In 1914," The Signal Corps Bulletin 82, January-February (1935), pp. 54-65. An important factor that was largely responsible for the small relative strength of the AEF Signal Corps was the extent of the wire facilities furnished by the French. Fifty-five percent of the wire miles used by the Americans were leased from the French and an additional 4 percent were American wires on French poles.

[6]War Department, Office of the Chief Signal Officer, Report of the Chief Signal Officer To The Secretary Of War 1919 (Washington, D.C.: Government Printing Office, 1919), pp. 22-23. Twenty-six of the forty "personnel types" specified by this report are included. These represent the ones either requiring significant technical skills, or represented new requirements for signal corps personnel.

Switchboard repairers and installers
Radio engineers
Constructors and operators
Electrical research experts
Meteorologists
Pigeon fanciers
Optical experts and field-glass repairmen
Instrument makers and repairers
Production experts
Gasoline and motor transport experts motor cyclists
Dry and storage Battery experts
Cable experts and operators
Draftsmen
Railway signalmen
Dispatchers
Cobblers
Stenographers

Field and telegraph battalions, laboratories, supply depots, telephone and telegraph systems, radio and special services, meteorological stations, and administrative and executive offices each had special personnel requirements. The Chief Signal Officer quickly realized required specialists, particularly for the first year of the war, could only be obtained in two ways; either by using, to the maximum extent possible, Army personnel whose civilian background and experience qualified them, or by enlisting and inducting into the Signal Corps civilians especially qualified for Signal Corps duties.

In April of1917, just prior to the declaration of war against Germany, the Signal Corps of the Regular Army consisted of 55 officers and 1,570 men. Of the 55 officers, 42 of them were on duty with Signal Corps organizations. The remaining 13 were distributed throughout the United States and her colonial possessions, on duty with the Chief Signal Offficer, department headquarters, Washington-Alaska Military Cable and Telegraph System, and at general supply depots. Fully half of the enlisted personnel were in the Washington-Alaska Military Cable and Telegraph System, while the remainder were loosely organized into separate field and

telegraph battalions. The National Guard, with a strength of 163 officers and 3,510 enlisted, was organized into ten field battalions and 16 separate companies, none of which were telegraph companies. The Reserve Corps, which had been authorized in the National Defense Act, did not at the time war was declared actually have personnel assigned to the 27 field battalions and 12 telegraph battalions authorized.[7]

TABLE 1
SIGNAL CORPS, REGULAR ARMY

ORGANIZATION	OFFICERS	ENLISTED MEN
FIRST FIELD BATTALION	5	159
SECOND FIELD BATTALION	7	157
THIRD FIELD BATTALION, CO B	2	75
FOURTH FIELD BATTALION, CO A	3	70
FIRST TELEGRAPH BATTALION	9	193
SECOND TELEGRAPH BATTALION	7	195
THIRD TELEGRAPH BATTALION, CO D	1	65
THIRD TELEGRAPH BATTALION, CO E	1	52
FOURTH TELEGRAPH BATTALION, CO D	1	58
DEPOT COMPANY F	1	120
DEPOT COMPANY G	1	69
DEPOT COMPANY H	1	153
DEPOT COMPANY I	1	115
DEPOT COMPANY K	1	57
DEPOT COMPANY L	1	32
TOTAL REGULAR ARMY	42	1,570

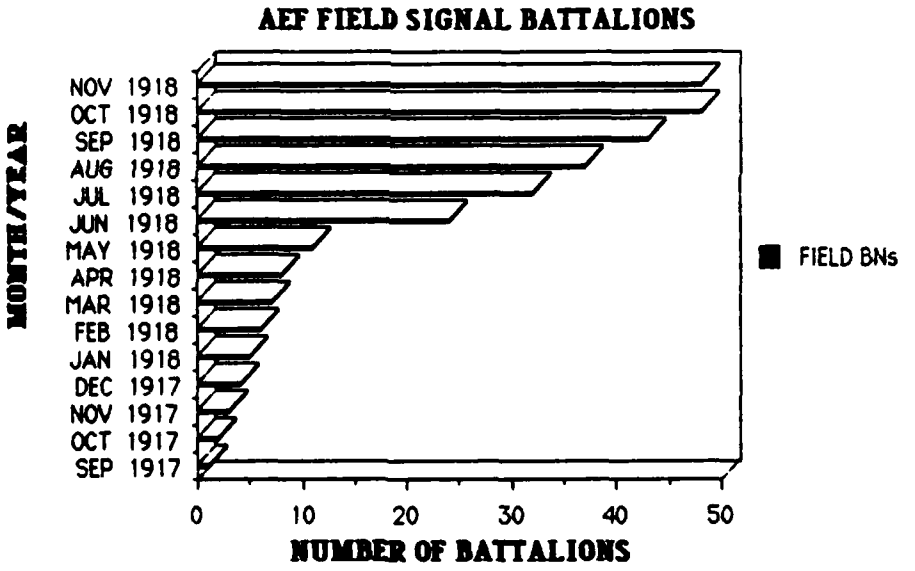
SOURCE: As of April, 1917. Published in the Report of the Chief Signal Officer To the Secretary of War 1919. (Washington, D.C.: Government Printing Office, 1919), p. 23.

In April, 1917 regulations provided one field battalion and one telegraph battalion to each infantry and cavalry division. The field battalion

[7]Ibid., pp. 23-25. At the signing of the armistice the strength of the Signal corps was 2,712 officers and 53,277 men. They were organized into 56 field signal battalions, 33 telegraph battalions, 12 depot battalions, 6 training battalions and 40 service companies.

provided communications support to the ground forces; the telegraph battalion supported the rear zone of operations. The distribution of signal troops was then determined by the organization of the combat division. Neither equipment nor organization had been materially changed as a result of the war in Europe. Prior to April, 1917, a third company had been authorized for the field signal battalion which was to be known as the outpost company. It would provide telephone communications between brigade and regimental headquarters. But in April, 1917, none of these companies had as yet been organized.[8]

GRAPH 1



SOURCE: Reflects number of Field Signal Battalions in the American Expeditionary Forces. Extract from Chief Signal Officer, S.O.S., Subject: "Copy of Signal Corps Appendix to Report of C.G., S.O.S. to the C. in C.. p.16. (Typewritten).

[8]Alfred E. Larabee, "The Signal Corps and Signal Communications," The Signal Corps Bulletin 31, March-April (1936), pp. 1-2

The first practical military application of the aeroplane was observation and reporting military positions. This was part of signaling in the warfare doctrine of the day. The linking of the wireless and the aeroplane made possible a new dimension of mobility, and a degree of command and control never before possible. As early as 1914, the Germans were thought to have about 120 aeroplanes active on the Western Front with a pool of trained pilots and support personnel readily available. The British actively used the aeroplane in the discovery of enemy artillery positions. thus providing their firing batteries with control and direction by October. 1914. In 1917, the struggle for air supremacy had already begun in Europe. Tactical and artillery reconnaissance capabilities were integral parts of their signal organizations. In the United States, neither the services, the public, nor Congress were enthusiastic about aviation. One Congressman replied to a Signal Corps request for funds for aeronautics: "Why all this fuss about aeroplanes for the Army? I thought we already had one."[9] The Report of the Chief Signal Officer, 1915, presented a different perspective.

> The recent war in Europe has emphasized the absolute necessity for an adequate aviation service, has illustrated in a most forceful way the dangers resulting from an inadequate supply of personnel and material, has shown that aeroplanes are invaluable for reconnoissance purposes, and that their absence from a combatant force has resulted in most serious disasters....The difficulties surrounding the creation of an adequate aeronautical service after the out-break of hostilities have been vividly illustrated during the past year.... The training of men, therefore is the crying need of the present time.[10]

[9]David L. Woods, A History of Tactical Communication Techniques (Orlando: Martin-Marietta Corporation, 1965), p.249. The publisher Robert F. Collier bought a Wright Type B aeroplane in early 1911 and lent it to the Army. The original Army craft was wearing out rapidly, and even the Wrights cautioned against rebuiling it.

[10]George P. Scriven, "Report of the Chief Signal Officer," War Department Annual Reports, 1915, 3 vols. (Washington, D.C., Government Printing Office, 1916), I, pp. 740-741

In April,1917, the Aviation section owned less than 55 training planes and 35 officers were rated as pilots. The Urgency Deficiency Act of 31 March 1916, gave the aviation section of the Signal Corps the greatest sum of money that had been appropriated for aviation in the Army- $500,000. Although the bulk of the appropriations were targeted for research, development and acquisition, they provided the financial resources to establish necessary training programs.[11]

TABLE 2
ARMY AVIATION APPROPRIATION

YEAR	AMOUNT
1912	$125,000
1913	100,000
1914	125,000
1915	250,000
1916	300,000
1916-1917, urgency deficiency	500,000
1917	13,281,666
1917-1918, urgency deficiency	43,450,000

SOURCE: C.McK.Saltzman, "Report of the Chief Signal Officer," War Department Annual Reports, 1917, 3 vols. (Washington, D.C.; Government Printing Office, 1918), I, p. 839.

At the outbreak of the war, beyond the general realization that a large Army would have to be raised, there was no definite plan as to its size nor the methods by which it was to be formed. The war with Spain provided the Army with an earlier perspective on the difficulty of organizing technical troops after the start of hostilities. In 1899, Colonel Samuel

[11]George P. Scriven, "Report of the Chief Signal Officer," War Department Annual Reports, 1916, 3 vols. (Washington, D.C., Government Printing Office, 1916), I, pp. 882-883.

Reber addressed a memorandum to Office of the Chief Signal Officer that stated:

> The principle that technical troops cannot be created after a declaration of war, first established during the War of the Rebellion, then recognized and adopted in the organization of the armies of the great military powers of Continental Europe, has again been brought into prominence and emphasized in such a way during the recent war with Spain as to make one hopeful that in the future the American Nation will never again have to repeat the experiment of organizing technical troops after the commencement of hostilities.[12]

WARTIME SELECTION

Upon America's entrance into the World War, the Chief Signal Officer made efforts to obtain the transfer of qualified soldiers from other Arms and Services. However, the War Department did not initially recognize the necessity of assigning occupational specialists to Arms and Services where their civilian skills would best be employed. On 10 May,1917, a plan was submitted to the Adjutant General for the organization of the remaining increments of the regular Signal Corps authorized by the National Defense Act of June,1916. At the same time, a concerted effort was made to fill the reserve units authorized prior to the declaration of war and which were being organized from the manpower pools of the Bell Telephone System, the Western Union and Postal Telegraph Companies.

Also in May, 1917, the first definite plan for raising the American Army was published by the Adjutant General within days after General Pershing's departure for France and was in general as follows:

> The Army of the United States was to be made up of the Regular Army, National Guard, and the National Army. The Regular Army was to be immediately increased by the addition of four remaining increments and raised to maximum war strength during the months of May and June. The National Guard was to be

[12]Samuel Reber, "Signal Organization," The Signal Corps Bulletin 66 (May-June 1932), pp. 35-36.

> called into Federal service in three increments-the first on July 15, the second on July 25, and the third August 5 Sixteen divisions of National Guards were to be federalized. The first 500,000 men of the National Army were to be called to the colors September 1 and put under training at once in the divisional cantonments. No approximation of the number of divisions into which the first draft was to divided was published.[13]

This necessitated the immediate raising of Signal Corps organizations only for the Regular Army and the National Guard. Thousands of men from the commercial telephone and telegram companies volunteered for duty within the Corps, and many more were assigned on a percentage basis out of the total number of recruits enlisting into the Regular Army.[14] In June, the hastily organized outpost company of the Second Field Battalion accompanied the First Division to France. The remainder of the battalion followed in July. Meanwhile, mobilization points were established and the first of the National Guard Signal units were called into Federal service. Anticipating the projected needs for qualified commissioned officers in the Corps, examination boards openly soliciated men from telephone and telegraph companies and technical schools and colleges.[15] So successful was the

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[13]War Department, Office of the Chief Signal Officer, Report of the Chief Signal Officer To The Secretary Of War 1919 (Washington, D.C.: Government Printing Office, 1919), pp. 26-27. The Signal Corps organization for the National Army would necessarily grow up, simultaneously with the various other organizations which would make up the National Army divisions, and would comprise for the first call the reserve field signal battalions which were already in formation.

[14]Marshall in The Story of The U.S.Army Signal Corps (pp. 144-145), further states that "In July, the calling out of the National Guard, 180,000 officers and men organized in sixteen divisions, added to the flood. In September the induction of draftees into the National Army-500,000 in a single day-added still more. And that kind of expansion continued month after month...."

[15]Early in the spring of 1917, primary consideration was given to men who had military training, but term of service and experience in the telephone business were considered as being of greatest importance. For example, an entire battalion was to be recruited from the Bell Telephone Company. "Almost without exception, those who were recommended for commission had completed over twelve years with the telephone company. Peter Lambert Schauble, The First Battalion: The Story of the 406th Telegraph Battalion Signal Corps, U.S.Army (Philadelphia, 1921), pp. 12-14.

commissioning of officers from the Signal Officer's Reserve Corps, that the program was stopped. Future requirements would be met through commissioning of the men already in service.[16]

On 25 June the Adjutant General requested that the Chief Signal Officer determine the size of a signal corps required to support 200,000 combatant troops organized into 10 divisions and 5 corps. The Signal Corps responded with the estimate of 265 officers and 5,755 enlisted men; fourteen officers and 246 enlisted men per division, and 25 officers and 459 enlisted men per corps. However, on 30 June, the first in a series of cablegrams requesting additional signal corps personnel arrived from AEF Headquarters. General Pershing was actively shaping the Signal Corps and expanding its role beyond the vision of anyone in the Office of the Chief Signal Officer. By Pershing's order, the Corps assumed the combat photography mission, to include making motion pictures of men in actual combat. The weather mission, for the first time since the transfer of the Weather Service in 1891, was assigned to the Signal Corps in France. Upon General Perishing's recommendation the Pigeon Service was established in July, 1917. Soon afterwards, he ordered the establishment of the Radio Intelligence Section; an assignment completely new to the Signal Corps.[17]

As a result of a series of conferences held with the American General Staff and the French on the "suitability of the organization of Signal Corps

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[16]Ibid., p. 27. However, mobilization of units in the summer and fall of 1918 exceeded all anticipated requirements.To meet the demand two initiatives were pursued by the Chief Signal Officer. First, the American Expeditionary Forces' candidate school increased its output by extending the hours of instruction presented per day and eliminating nontechnical instruction. Then, early in October, 1918, the Army Signal Schools were tasked to supply 1,200 signal officers from enlisted candidates by 1 July, 1919. This mandated curtailment of other instruction with officer training as the priority. The signing of the armistice eliminated the necessity of continuing this plan.

[17]Ibid., p. 28.

troops for meeting conditions along the front," significant changes were made. Conference participants realized the employments of the field signal battalions in the divisions should be divided into small detachments. This was mandated both by the new signaling devices available to the combat units and the conditions prevalent in trench warfare. The work of the Corps would extend down to the regiment which would provide its own signaling personnel to the line. The French regiment employed over 240 men for messenger and telephone service. Under conditions of trench warfare, the number of men necessary to operate and maintain the communication means of one regiment would be 125, versus the 61 authorized. It was proposed to reorganize the outpost company of the field signal battalion to fulfill the communication requirements of infantry regiments deployed in trench warfare. This recommendation met with significant resistance within the AEF General Staff since it was a matter of American policy that the division was organized for open warfare.[18]

In August, the outpost company increased from an authorization of 75 men to a strength of 280 men. This provided a signal platoon of one officer and 65 men to each Infantry regiment of the division in trench warfare. During open warfare it was determined that these platoons would detach from the Infantry regiments and constitute the Signal Corps reserve. The 1919 Report of the Chief Signal Officer evaluated the restructure by concluding,

> Unsatisfactory as this arrangement has been in some ways, it at least provided the necessary personnel for the communications for the division during the entire war. It is easy to see now that this matter was looked at in a short-sighted way. No one appreciated at that time that a division in open warfare required just as much, if not more, communications than a division in trench warfare. No one foresaw clearly the difficulties

[18]Ibid., p.359

> of a mixed command of Infantry and Signal Corps troops in an Infantry regiment. No one foresaw in its true light the artillery situation with regards to communications, nor the need for elaborate installations in charge of permanent personnel at brigade and division headquarters. The conference out of which grew the increase of the outpost company was interesting, particularly because it was the first expression of the needs of the American Forces for more communications.[19]

MANPOWER REQUIREMENTS

A strength survey conducted by the Office of the Chief Signal Officer on 1 December,1917, reflected that of the 38,000 enlisted men authorized, 21,875 were in the force. The number of officers was 1,354 against authorizations for 1,646. Compounding this situation was the1919 fiscal year manpower projection. The enlisted strength estimate was 90,000; the officer strength requirement was projected for 5,000.[20] Until the summer of 1917, the Army's policy recruited by voluntary enlistments, rather than selective service. This was primarily because:

> In some quarters the opinion prevailed that this source of personnel was unlimited and that a sufficiently experienced personnel existed in the United States to furnish the necessary supply of telegraph and telephone operators, switchboard repairmen, multiplex and radio operators, cable men, line men, ect., to complete such Signal Corps units as would be required in the operation of the Army overseas. This view did not take into consideration the great change that resulted in the business world...engaged in war....This, of course, brought about the need for additional personnel on the part of the telegraph and telephone companies which continued to be more and more acute....[21]

However, industry was not the only competitor for this manpower pool. Men whose technical skills and training were urgently required were enlisting for combat or fighting units, thus a loss to the technical services.

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[19]Ibid., pp. 358-360.

[20]Ibid., p.42.

[21]Ibid., p. 65.

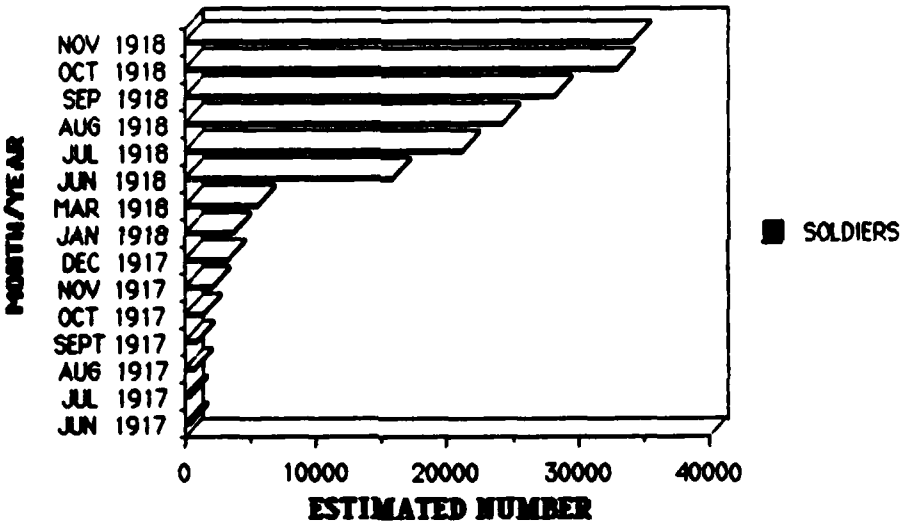
An inability to secure the transfer of signal qualified technicians from combat organizations to the technical services made it necessary to ensure that every recruit, upon enlistment, was placed where his particular skill would be most valuable to the service. The Selective Service Law passed by Congress on 18 May, 1917, and modified in 1918 ensured that the emphasis included not only the task to secure a fighting force but also that of identifying available manpower. This facilitated the assignment of an individual to a position in the military service, or in essential wartime activities, where his special abilities could best be used. Although many occupational specialists became available to the Signal Corps, it was evident during the first few months of the World War, that this source of supply would soon be exhausted.

From data compiled by the Chief Signal Officer in 1918, it was estimated that a continuous flow of 4,000 Signal Corps men per month was necessary. The arrangments made by the Chief Signal Officer for this personnel requirement contemplated obtaining 2,000 men per month from schools supervised by the Signal Corps and administered by the Committee on Education and Special Training; 1000 men per month from the schools conducted by the federal Board for Vocational Education; and 1,000 men per month from the general draft. A plan to obtain 75 percent of all required Signal Corps personnel from enlisted men who had completed the Signal Corps' course of instruction was eventually worked out and it in turn did accomplish the desired end.[22]

[22]Ibid., pp. 73. The enlisted personnel of the field signal battalions assigned to the last fifteen divisions organized was satisfactory. The personnel output from the training base was the the major contributing factor.

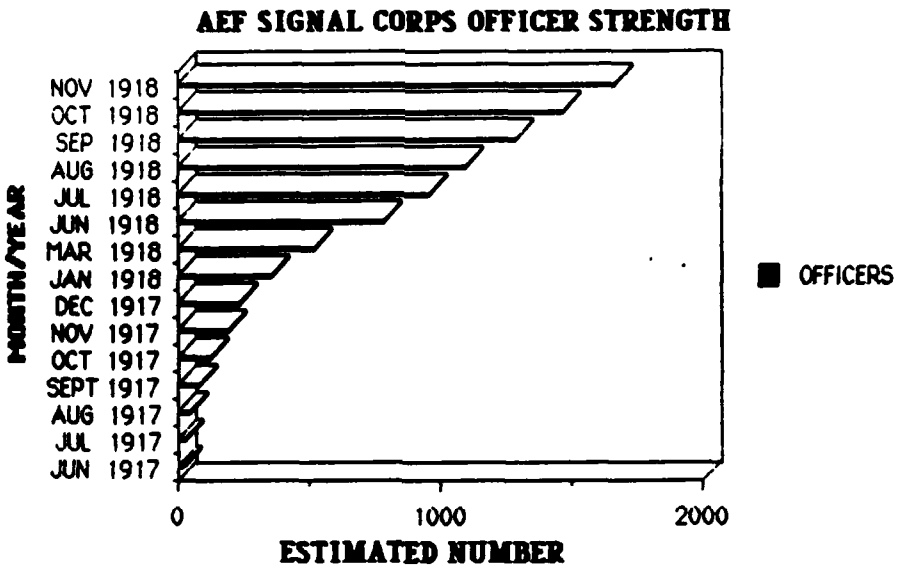
GRAPH 2

AEF SIGNAL CORPS ENLISTED STRENGTH



SOURCE: *Reflects number of Signal Corps Enlisted Soldiers in the* American Expeditionary Forces. The figures represent the estimated strength of all Signal Corps personnel assigned both to the "Service of the Front" and the "Service of Supply." Extract from Chief Signal Officer, S.O.S., Subject: "Copy of Signal Corps Appendix to Report of C.G.,S.O.S. to the C. in C., p.16. (Typewritten).

GRAPH 3



SOURCE: Reflects number of Signal Corps Officers in the American Expeditionary Forces. The figures represent the estimated strength of all Signal Corps personnel assigned both to the "Service of the Front" and the "Service of Supply." Extract from Chief Signal Officer, S.O.S., Subject: "Copy of Signal Corps Appendix to Report of C.G.,S.O.S. to the C. in C., p.16. (Typewritten).

Yet this was not done without great difficulty. The specialists required as replacements, or for the building up of new units, needed to be trained in the United States by, or under the supervision of, the Signal Corps. The Training Section of the Personnel Division,Office of the Chief Signal Officer, organized 16 February 1918, assumed the responsibility of training all the branches in signal work. Its challenge was to turn out qualified signalmen and technicians in the shortest time possible. Training facilities based on a 2,300 man Signal Corps were inadequate to train an infinitely greater number that was growing by the month. This mandated the use of civilian

educational institutions[23], as well as, military schools established around the country.[24] But the greater challenge was to get the right type of man into the training base.

TRAINING

In 1936, MG James B. Allison, Chief Signal Officer of the Army, wrote his reflections on the challenges he faced in the World War while assigned the responsibility of training Signal Corps replacements. Before the signing of the armistice, Allison trained and forwarded 25,000 Signal Corps officers and enlisted replacements to the AEF. Yet, when Allison received his first detachment, he declares it "was so unsuitable for signal communication training that I made a special report to the War Department on the subject and requested that selected personnel be sent from the depot

[23]The Report of the Chief Signal Officer 1919 (p. 66) states, "Foreseeing the grave conditions which would eventually be presented by the shortage of competent trained personnel, and realizing the advantages of training men at educational institutions where instructors in electrical engineering subjects and electrical equipment for laboratory work were available, there were started in July and August, 1917, schools at the University of Vermont, College of the City of New York, and the A.&M. College of Texas, for the preliminary technical training of personnel for the Signal Corps. These three schools had an authorized strength of approximately 550 men; a course of study lasting 13 weeks was given in the elementary principles of electricity and its application to devices of communication, with special reference to radio." This reflects but one of the many agreements entered into by the Signal Corps with various colleges around the country. Of particular note is one other such agreement. Men between the ages of 21-31 eligible for military service under the provisions of the Selective Service Regulations, were allowed to receive instruction as buzzer operators at various schools prior to being called into active service. "This source of personnel was fruitful as long as there remained available men in Class 1-A of the registrants of June 5, 1917, and several thousand men were secured who...were able to receive on a buzzer from 15-20 words in International Morse Code." The men were secured by individual induction and assigned according to their general qualifications.

[24]On 16 May, 1917, The Adjutant General of the Army authorized The Chief Signal Officer to establish training camps for signal troops at Long Branch, New Jersey, Fort Leavenworth, Kansas; Leon Springs, Texas; and Presidio of Monterey, California. Early in 1918, the Signal Corps was authorized to build facilities at Camp Meade, Maryland. This action pemitted the concentration of signal relayed activities and training into one area. Completed in September, 1918, this site accomodated 15,000 officers and enlisted men of the Signal Corps.

battalion." The War Department did not share his position, and his request for selected personnel was denied. Only through his persistance, did the War Department finally recognize the need for personnel who had some basic electronic/signaling aptitude. His warning that he would not be able to meet General Perishing's overseas demands as long as he continued to receive men who could not read or write, resulted in some improvement. But,

> ... the effort to produce communication personnel in sufficient quantities from that time on proved to be a very strenuous one and, in my opinion, if the war had lasted much longer would have failed to produce personnel sufficiently advanced in communication instruction to assume their duties on arrival in the A.E.F.[25]

The British Army had discovered that, irrespective of the training given in the British Isles prior to the transfer of personnel to France, further training was required after replacements arrived in country. Early in August,1917, a staff section of the AEF was established with the responsibility of directing all training activities. The original training plan for the American Expeditionary Forces in France visualized six divisions for each Army corps; four combat and two replacement divisions. Of the two Replacement Divisions, one was to be established in some convenient training area behind the general position of the combat division. The other, or depot Division, was to be stationed near the base ports. It was to receive drafts from the United States and give them basic military and individual specialist training, including target practice. From the Depot Division, men were to be sent to the other replacement division for the completion of their training. The above scheme was not put into effect because of the acceleration of personnel requirements on the front. Thus, the missions of

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[25] James B. Allison, "Some Thoughts On Signal Communications In The Theater Of Operations," The Signal Corps Bulletin 89 March-April (1936), pp 5-6

Corps Schools was to train officers and non-commisioned officers as rapidly as possible, and return them to their units as instructors.

The training of Signal Corps personnel was very important. The increased demand for officers in the AEF tasked the capability of Signal Officer CandidateSchool. It became necessary to transfer the training of mobile unit personnel from the Army Signal Schools to the Corps Signal Schools. As part of the Army School Center at Langres, France, the Army Signal Schools were organized in December, 1917. The first course of instruction was conducted for the training of Radio Intelligence Specialists, followed in January, 1918, by two other courses; one for officers and enlisted men of combat units, the other, a Field Officer's Course. The tactical use of signal equipment was emphasized in this course, and the possibilities and limitations of the various types of equipment carefully explained.[26]

It was decided that the training of all divisions would take place as they arrived in France. In the fall of 1917, it seemed that divisions could be alloted a training period of about three months. The region assigned to the American troops during the periods of training were divided into 225 square mile divisional areas. The Signal Corps telephone and telegraph backbone communication system passed through this region, south to north from Dijon to Toul, and east to west from Neufchateau via Chaumont and Troyes to Paris. Each area was connected to this main system and then extended into the divisional area for internal communications, there-

[26]War Department, Office of The Chief Signal Officer, "Wartime Selection, Training and Replacement of Signal Corps Personnel," The Signal Corps Bulletin 86 (September-October 1935), pp. 7-9

by connecting the principal units dispersed through its many villages. Arriving divisions were thus able to begin their training functions at once.[27]

The field signal battalion's workload and training schedule depended upon the maneuvers of separate organizations of the division. The Second Field Signal Battalion, the first of its kind to be trained in France, was organized as were other divisional signal battalions. It consisted of a radio, wire, and outpost company. For their training, an officer, assisted by noncommissioned officers from the Eighth French Engineers (a regiment of 64,000 communication personnel), presented instruction on the French methods of signaling. The British also presented instruction on their methods. After classroom demonstrations and pratical application, personnel were sent to the front line trenches for observation of actual signaling equipment in use. These soldiers then assumed the responsibility of teaching their fellow soldiers. An officer and a detachment of noncommissioned officers and men were assigned to the First Artillery Brigade at Le Valdahon, and to the Infantry regiments for the purpose of familiarizing themselves with artillery fire and communications between troops in action. Voluntary evening classes were formed in the use of the buzzer-phone, T.P.S., radio sets, switchboard operations, telephone construction and maintenance, and other subjects.[28]

During the winter of 1917-1918, three more American Divisions arrived: the 26th, 42th and 2d. The 101st Field Signal Battalion, 26th Division, went into the Chemin-des-Dames sector north of Soissons; the 117th Field Signal Battalion, 42nd Division to Luneville; and the 1st Field Signal

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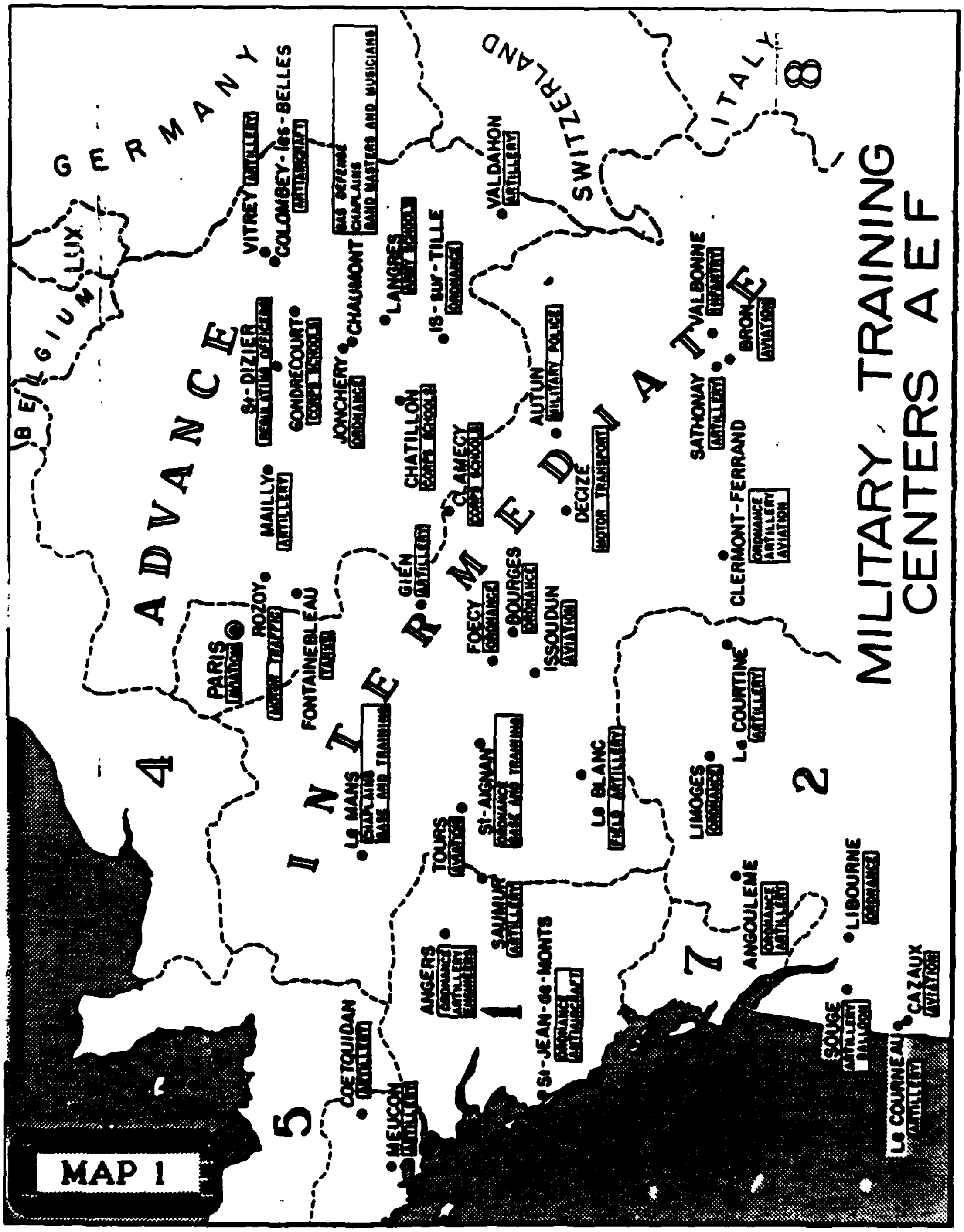
[27]Chief Signal Officer, S.O.S, Subject: "Copy of Signal Corps Appendix to Report of C.G.,S.O.S. to the C. in C.," Report of the Commanding General S.O.S. Commander In Chief, 3 vols., American Expeditionary Forces, dated 28 May, 1919, 3, pp. 64-65.

[28]Major John L. Autrey, "Communications in the First Division," The Signal Corps Bulletin (May-June 1937), pp. 5-6.



SOURCE: Historical Division, Department of the Army, United States Army In The World War 1917-1919, vol. 14, Reports of Commander-In-Chief A.E.F. Staff Sections And Services (Washington, D.C.: Government Printing Office, 1948), p 300

Battalion, 2d Division, into the Sommedieue sector north of Verdun. Thus, by the middle of March, four battalions were receiving instruction from the French at the front.

> The development in those first sectors, and the lessons there learned, served as an excellent guide in arranging the work of the Signal Corps for the divisions that were to follow. New combat organizations, such as Sound Ranging Sections, Searchlight Companies, Trench Mortar Batteries and Tank Formations, appeared and called for service and equipment. Entirely new types of equipment were requested and much of the activity of the technical service of the Signal Corps during the Winter of 1917-18 was concerned with their development and adaptation.[29]

Early in 1918, it became apparent the three month training period would have to be shortened. The ongoing war would not permit it. A four week program was established, however, the basic ideas of the three month training concept was maintained and subdivided into three phases. Phase one of the training consisted of maneuvers in a training area behind the lines. The second phase deployed the unit into a quiet sector, allowing the troops to go in by battalions with French units. The third phase then concentrated on additional work behind the lines, with special emphasis focused on units requiring additional training. The field signal battalion's matured training program during the first phase of training is herewith reproduced:[30]

> 1. The organizational commander must be impressed with the necessity for energetic and progressive training. Inclement weather must not be permitted to stop the training. Much instruction can be given under shelter. The organizational commander must arrange the work so that no time will be lost.

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[29]Chief Signal Officer, S.O.S, Subject: "Copy of Signal Corps Appendix to report of C.G., S.O.S. to the C. in C.," Report of the Commanding General S.O.S. Commander In Chief, 3 vols., American Expeditionary Forces, dated 28 May, 1919, 3, p. 65.

[30]War Department, Office of the Chief Signal Officer, Report of the Chief Signal Officer To The Secretary Of War 1919 (Washington, D.C.: Government Printing Office, 1919), pp. 102-103.

2. The divisional signal officer will exercise such supervision of this training as is necessary to secure the results desired, viz. a battalion which will furnish the division with a reliable system of communications.

3. All trench and aerial lines constructed for instruction purposes will be utilized in the battalion period for combined training. The division signal officer will therefore describe the plan of construction so that the system of lines thus constructed will simulate the wire system of a division. This system will include stations for headquarters and posts of command for all units in the division.

First Period - German(sic) Instruction (two weeks)

Outpost Company:

- Visual signals,lamps,panels,fireworks.....6 hours
- Trench-line construction,aerial and cable.....36 hours
- Telephone and switchboards.....12 hours
- Fullerphones.....12 hours
- Defense against gas.....6 hours

Wire Company:

- Visual signals,lamps,panels,fireworks.....6 hours
- Line construction and operation.....18 hours
- Trench-line construction,aerial and cable.....18 hours
- Telephone and switchboards.....12hours
- Fullerphones.....12 hours
- Defense against gas.....6 hours

Radio Company:

- Earth telegraphy.....18 hours
- Radio telegraphy.....18 hours
- Visual signals,lamps,panels,fireworks.....9 hours
- Buzzer practice.....12 hours
- Codes and ciphers.....9 hours
- Defense against gas.....6 hours

Second Period - Battalion Instruction (two weeks)

Operation of a division system of communications.....36 hours

- Operating of station
- Handling of messages
- Locating and repairing faults

Correcting deficiencies in company.....36 hours

4. The Signal Corps will take part in weekly terrain exercises as required by the division schedule.

5. Schools will be conducted three hours weekly, as follows:

Officers School:

Liaison for all arms-

Solution of signal problems-

(a) Assuming offensive combat

(b) Assuming defensive combat

Company Noncommissioned Officers' School

Liaison for all arms

Pamphlets descriptive of new equipment

This constituted the communications training in the deployed divisions. However, even this schedule was not practical, especially during the emergency of May, June,and July of 1918 when units were needed almost immediately on the front. Also, the German offensive in March,1918, created a tactical situation that required the American troops placed in the British sectors to be trained by the British. Programs and methods were generally the same as in the French sectors, however shorting of even the abbreviated scheduled was the norm during 1918.[31]

CONCLUSIONS

The effectiveness of the Signal Corps to procure and train technical pesonnel to meet the initial mobilization tactical communication requirements and then to sustain that force until the armistice was indeed both a challenge and a struggle. At the time of the armistice, the Signal Corps' strength was 2,712 officers and 53,277 men, divided between the AEF and the forces in the United States. In the space of nineteen months, it had increased in size thirty-five times. These figures did not include the Aviation Section. On 20 May, 1918, the Aviation Section, consisting of 16,084 officers and 147,932 men, separated from the Signal Corps to become the

[31] Ibid., p.104.

Aviation Department of the United States Army. In thirteen months it had increased in size 142 times.[32] In a letter to the Chief Signal Officer. American Expeditionary Forces, dated February, 1919, the Commander-in-Chief of the A.E.F. stated:

> **Each Army, Corps, and Division has had its full quota of Field Signal Battalions, which, in spite of serious losses in battle, accomplished their work, and it is not too much to say that without their faithful and brilliant efforts and the communications which they installed, operated and maintained the successes of our Armies would not have been achieved.[33]**

It would seem that the Signal Corps response to providing a tactical signal force capable of exercising the Army's signaling arm was successful. However, raising and training the force was just the beginning. The tactical communications equipment and its employment in battle would make the soldier a signalman. In the last year of the Great War, the Signal Corps would be given the opportunity to undergo the ultimate test- the test of battle.

[32]Marshall, pp.144-145.
[33]Ibid., p. 11

CHAPTER THREE

THE TEST:
THE TACTICAL SIGNAL ORGANIZATION UNDER THE STRAIN OF BATTLE

BACKGROUND

The first units of the American Expeditionary Forces were in France, and the Allies were anxious for an expanded combat commitment on the part of America. The war was about to enter its fifth year; a year that found Germany "riding the crest of the tide with her much desired peace by victory apparently within reach."[1] The Second Field Signal Battalion, the first Signal Corps combat unit to reach France, was the first to receive training and go to the front. Their training experience, combined with earlier studies of the British and French signal organizations, provided the basis for organizing the American Signal Corps in France.[2] These original plans for the signal organizations of the infantry division evolved in July and August, 1917 and were published in the Table of Organization and

[1]Everett E. Brown, "Operations On The Western Front From July 15-17, 1918" (Infantry School Monograph, Fort Benning Georgia, 1925-26), p. 1.

[2]A number of conferences were held mid-June to early July, 1917, between the AEF General Staff and French liaison officers assigned to AEF Headquarters. Of particular importance was the meeting with the chief of communication service of the grand quartier general of the French Army , regarding "the suitability of the organization of Signal Corps troops for meeting conditions along the front." War Department Office of the Chief Signal Officer, Report Of the Chief Signal Officer To The Secretary Of War 1919 (Washington, D.C.: Government Printing Office, 1919), pp 358-359

Equipment, United States Army, Series "A", dated January, 1918.[3] The employment of these signal units in the division would involve the use of multiple communication means. The doctrine governing their use was based on the combat experience of others, but that would soon change.

THE TACTICAL SIGNAL ORGANIZATIONS

TABLE 3
DIVISIONAL SIGNAL UNITS

UNIT	OFFICERS	MEN
Division Signal Office	1	1
Field Signal Battalion		
Headquarters and Supply	3	29
Radio Company	3	75
Wire Company	3	75
Outpost Company	5	280
Infantry Signal Units:		
Each Brigade Detachment	0	8
Signal Platoon of each Regiment	1	76
Artillery Signalers:		
Brigade Detachment	2	18
Regimental Detachment for each 75 mm. regiment	6	40
Regimental Detachment for each 155 mm. regiment	8	48
Each Machine Gun Battalion	0	9

SOURCE: Table of Organganization and Equipment, United States Army, Series A, 14 January, 1918; and Training Circular No. 6, Organization and Duties of Signal Units, 1918.

[3] An infantry division at full strength consisted of about 28,000 men and officers. It was the smallest complete battle unit, with balanced forces of infantry, artillery, engineers, signal and sanitary troops, trains (motor and horse drawn trasportation), staffs and auxiliary services necessary for a mobile force to conduct necessary operations.

The Signal Corps' responsibility extended down to the infantry regiment and the field artillery brigade. Within the regiment, the infantry supplied the signal personnel. A field signal battalion was assigned to each infantry division to install, operate and maintain all signal means above the infantry regiment and artillery brigade.[4]

A division signal officer, a photographic section, and a field signal battalion were authorized at division level. The Field Signal Battalion consisted of a Wire Company, Radio Company and an Outpost Company. The wire and radio companies provided communications support at division headquarters and to, but not including, infantry regiments and the artillery brigade. The outpost company of the field battalion reinforced the infantry regiments or served as a division reserve.[5]

The Wire Company installed, maintained and operated, in conjunction with area detachments, the telephone and telegraph systems from division to regimental headquarters. This included the telephone centrals at the main junction points of the wire system. It also was prepared to handle all forms of visual signaling.

The Radio Company installed and operated the radio stations at division and brigade headquarters and, in conjunction with the artillery signalling personnel, the divisional artillery units. It could be called upon to operate ground telegraphy sets at the division headquarters, and to furnish personnel for listening-in sets, radio intercepting and goniometric

[4]United States Army, Table of Organization and Equipment, Series A, 14 January 1918, and The War Plans Division's Training Circular No. 6, Organization And Duties Of Signal Units,published in October, 1918. It superceded all prior publications with this subject. This circular reflects the organizational structure and associated responsibilities of the Divisional Signal Units as it actually was in the AEF around April, 1918.
[5]United States Army, Table of Organization and Equipment, Series A, 14 January 1918

stations installed in the divisional area.[6] It was to be prepared to operate all visual signaling agencies.

The Outpost company was divided into a headquarters detachment of one captain and twenty men, and four regimental platoons of one lieutenant and sixty-five men. The headquarters detachment acted as a reserve for commitment to the regimental platoons and performed special services around the headquarters. During trench warfare, each regimental platoon was permanently assigned to a infantry regiment of the division. Installation, maintenance and operation of the regimental telephone system was its primary function. Handling buzzer-phone messages and all forms of visual signalling was also its responsibility. In open warfare it was wholly or partially withdrawn to serve as a divisional signal reserve asset.

In each infantry regiment, a signal platoon, strengthen by a platoon from the Outpost Company, operated the regimental wire system. It was organized into regimental and battalion sections, and a telephone construction section that furnished personnel to the regimental headquarters. The regimental platoon operated visual signals of all kinds, damped wave radio and ground telegraphy, and the pigeon service. The withdrawal of the out-

[6]Listening stations copied telephone and T.P.S. messages, securing valuable enemy information, and at the same time policing friendly telephone lines to ensure sensitive information was not transmitted in the "clear."Ground intercept stations copied messages,practically always in code, from German ground-radio stations, recording all the facts regarding their operation. Ground Goniometric stations secured bearings on enemy radio stations, the transmittal of which to the Radio Intelligence Section, General Staff, enabled the latter accurately to locate the stations, and by the intercepted messages work out the enemy network and organizational structure. The importance of these stations cannot be underestimated. For example, prior to the start of the St. Mihiel Offensive, intelligence indicated German forces had withdrawn For this reason, serious consideration was given to advancing the infantry without artillery preparation. The final decision to execute the original plan with artillery prepartion was based on the evidence of the goniometric service that enemy radio stations were still active in their old locations. Chief Signal Officer, S O S, "Signal Corps Appendix to Report of C.G.,S.O.S., to the C. and C." France, 28 May 1919, pp. 75-78. (Typewritten)

post platoon in open warfare required the regimental platoon(-) to operate the regimental telephone system.

All infantry companies, the artillery brigade headquarters and all artillery batteries were authorized personnel to operate their agencies of signal communication. The Division Signal Officer assigned to the artillery personnel needed to install and operate the large permanent switchboards of the artillery centrals. He also provided supervisory radio operators for the artillery radio stations. However, the artillery assumed responsibility for the operation of all visual signalling, the temporary telephone systems and the radio stations around groups, batteries and observation posts. Since the individual unit commanders decided the number and type of specialists to be trained, a lack of uniformity was present throughout the A.E.F. and exemplified by each individual infantry division.[7]

MEANS OF COMMUNICATION

Message carrying agencies included runners and mounted orderlies, rockets, message carrying projectiles, dogs[8] and carrier pigeons. It is of particular interest that prior to the war with Germany no pigeon service

[7]Captain L.P. King, "A Critical Analysis Of The Employment Of Signal Communications By The 1st American Division at SOISSONS" (Individual Research Study, The Command and General Staff School, 1933), p. 13. These tables of organization made no provision for assignment of personnel to specific communication equipment, except in Artillery units.

[8]The British developed a shoulder pack which permitted a trained dog to pay out signal wire. Dogs loaned to the AEF by the British, French and Belgian units were used in ambulance, sentry and "some messenger duties." The 102nd Field Signal Battalion on the 27th Orion Division apparently used a group of trained messenger dogs in August, 1918, over ground that was impassible to men. David L. Woods, A History of Tactical Communication Techniques (Orlando: Martin-Marietta Corporation, 1965), p. 61

existed in the American Army.[9] On July16,1917, the Chief Signal Officer of the American Expeditionary Forces wrote to the Chief Signal Officer of the Army the following:

> Careful investigations have been made of the carrier pigeon service of the French and British armies in France. Access has also been had to some of the material and documents captured from the Germans which indicate the uses they have been making of carrier pigeons. There is no longer any doubt of the immense importance of this service, and the necessity of the immediate action of the United States to provide similiar service for our armies.[10]

Although the Army Pigeon Company was not officially created until 18 June,1918, the Signal Corps Pigeon Service began to function with combat troops on 22 February,1918. The first American mobile loft, housing 60 pigeons, at First Division's Headquarters, soon became "the most dependable means of communications in the area." [11] The Pigeon Service had two missions. Its primary mission was to establish and maintain a frontline communication service; the secondary mission was to train combat troops in the art of pigeoneering. The distribution of pigeons depended on the number of available and the operational situation. Although an Army Corps level asset, attachment to the division was the current employment doctrine. The greatest use of pigeons was made by the Infantry in front line trenches or the attack, though practically all branches of the service

[9] David Woods in A History of Tactical Communication Techniques (p. 64.) takes important notice that the United States Army Signal Corps had begun experiments with pigeons in the Dakota Territory as early as July, 1878. Unfortunately, local hawks ate most of the pigeons, and no action was taken toward a permanent program. In the 1917 Field Service Pocket Book provided more information on pigeons than on any other method of communication.

[10] War Department, Office of the Chief Signal Officer, Report Of the Chief Signal Officer To The Secretary Of War, 1919 (Washington, D.C.: Government Printing Office, 1919), p. 338.

[11] Chief Signal Officer, S.O.S., "Signal Corps Appendix to Report of C.G.,S.O.S., to the C. and C." France, 28 May 1919. (Typewritten)

employed them.[12] Pigeons were attached to the brigade forward station, artillery liaison officers, forward observing officers, and to each attacking battalion.

TABLE 4
TYPES OF MESSENGERS AVAILABLE
in the Infantry Division

HOS TYPE	RUNNERS	MOUNTED	BICYCLE	MOTORCYCLE
Division	Yes	Yes		Yes
Infantry Brigade	Yes	Yes		Yes
Infantry Regiment	Yes	Yes	Yes	
Infantry Battalion	Yes	Yes	Yes	
Infantry Company	Yes			
Artillery Brigade	Yes	Yes	Yes	Yes
Artillery Regiment	Yes	Yes	Yes	Yes
Artillery Battalion	Yes	Yes	Yes	Yes
Artillery Battery	Yes	Yes		

NOTE: Motor cars were available at all headquarters above infantry battalions and artillery batteries; and aeroplanes were available, depending upon the operational situation, to the division for messenger service.

SOURCE: Table of Organization and Equipment, United States Army, Series A, January 14, 1918.

Runners and mounted orderlies filled the gap when other means failed. These were special men, characterized by determination and fierce courage. Mounted orderlies, provided by the Corps, were the alternate communications means between advanced divisional and brigade

[12] "The greatest difficulty experienced by the personnel of the pigeon service during the world war was overcoming a tendency on the part of other branches to look upon pigeons as a joke, and it was necessary to develop a feeling of confidence that the birds would deliver their messages even under the most adverse conditions." The intensity of shell fire often rendered communication by radio and telephone impossible, delayed runners, and obstructed visual signalling. Pigeons were undeterred by these conditions. Captain Frederick C. Lincoln, "The Military Use Of The Homing Pigeon," The Signal Corps Bulletin 57 (November-December 1930), pp 45-46

headquarters. Runners were required to be thoroughly familiar with all routes in their immediate area. Their extra benefits, designed to partially offset this hazardous duty, were dug-out accommodations when possible and a supply of rum when the work was hard.[13]

Wire Telephone. Each headquarters to include infantry battalions and artillery batteries were equipped with wire and telephone equipment.[14] The type extensively used in France was the EE-5 telephone. It was a commercially designed instrument, light weight and portable, previously used for forest-patrol work. Equipped with a hand set, it gave the operator the use of but one hand. The buzzer phone , an improvement on the British Fuller phone, could be used to transmit buzzer signals or act as a normal telephone. The advantage of this telephone was the fact buzzer signals could be transmitted between two telephones of this type with no possibility of interception by the enemy.[15]

Wire Telegraph. Field service buzzers[16] were authorized in the field signal battalion, but due to the ease with which their signals were

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[13]War Department, War Plans Division, Inter-Communication in the Field (1918), pp. 42-43. This was a reprint of an official British pamplet. This publication included and revised W.D. document No. 599, "Forward Inter-communication in Battle," May, 1917.

[14]Fred G. Borden, "Development of Wire-Laying Equipment," The Signal Corps Bulletin 71 (March-April 1933), p. 34. Approximately at the time the United States entered the World War, Type N of cart, type K-1 was developed, standardized and began production. The cart weighed 1,360 pounds and carried 2-1/2 miles of twisted field wire that weighed 450 pounds.

[15]George I. Back, "The Telephone; Commercial v. Military History And Development," The Signal Corps Bulletin 42 (March 1928), pp. 13-14.

[16]Often referred to as "The Service Buzzer"," it was considered as one of the most efficient and serviceable instruments used in the army in 1915. A portable device it could be employed as a telephone of for sending telegraph signals. When use the latter way, the sound received on the distant end receiver was similiar to a high frequency radio spark. BG George P. Scriven, Circular No. 8, The Service Of Information United States Army (Washington, D.C.: Government Printing Office, 1915), p 109

monitored, France prohibited their use.[17] Two other forms of the wireless telegraphy were Spark Transmission (the "Trench Set," "Wilson Set. Loop Set") and Continuous Wave, the C.W. Wireless Set. The Trench set required an aerial 60 yards long and 12 feet high with a range up to 4,000 yards. The C.W. Wireless Set, more portable with an aerial requirement of only 30 feet long and 2-3 feet high, had a range of 6,000 yards without the risk of jamming other stations. The mutual interference of sets, combined with the need for reasonably dry set-up areas, restricted their employment.[18]

Radio. Pre-World War I radio transmissions were limited to Morse code and CW. The American Signal Corps upon entrance into the war was equipped with large high-powered quench spark transmitters. Called "pack radio sets (SRC-49)," they could be broken down for transport loaded on two or three mules. The conditions of trench warfare dictated to the Allies the development of special types of radio apparatus based on the application of the vacuum tube and portable batteries. After investigation, the AEF adopted them for own their use. "Consequently, all the field radio equipment which the U.S. Army employed in France during its first year of fighting were the superior sets which were obtained from the British and French." Three general types of radio were issued to the division: Type E-3, a continuous wave vacuum tube transmitter and receiver; No. 3 Spark transmitter and A-1 Spark receiver; and the TPS or "Earth Telegraph Sets."

[17]U.S. Army, War Department, Power Buzzer Amplifier (1918), pp.15-20. The weight of the Power Buzzer-Amplifier Set, complete, was 72 pounds. In an attack from an organized trench system, it usually was installed near each brigade cablehead. Three battalion signallers trained in its use were required for each set, and could make it operational in three or four minutes. A range of about 2,000 yards could be achieved under ordinary conditions. Owning to the interference of neighboring sets, it normally became necessary to allot times to the different power Buzzer Stations for sending. All messages sent by this means "in the clear" was to be considered information lost to the enemy

[18]War Department, War Plans Division, Inter-Communication in the Field (1918), pp. 39-40

This equipment was all radiotelegraph. Not until mid-1918, would the United States develop a radiotelephone, or voice radio. However, its development would be too late for use by the signal soldier assigned to the infantry division in World War I.[19] The Signal Corps:The Emergency concludes:

> Radio carried little of the war's communication load. In the first place, the tactical situation again and again brought the western Front into small areas and mired it there. For another reason, although nearly 10,000 radio sets...were produced...the conflict was over too soon for the combat signalman or aviator to use them much. Finally radio was too new to have passed the awkward age. Spark-type equipment did have the advantage of not having a skilled man to tune it or mend it, but was so heavy it could scarcely be moved, was often unintelligible, and was frequently out of commission.[20]

TABLE 5
RADIO EQUIPMENT AVAILABLE
to the Infantry Division

HQS TYPE	E-3	SPARK	TPS	RECEIVE ONLY SPARK
Division	Yes	Yes	Yes	Yes
Infantry Brigade		Yes		
Infantry Regiment		Yes	Yes	
Infantry Battalion			Yes	
Artillery Brigade	Yes			Yes
Artillery Regiment				Yes
Artillery Battalion				Yes

NOTE: Aeroplanes were equipped with spark transmitters which all infantry and artillery spark receiving sets could monitor.

SOURCE: Table of Organization and Equipment, United States Army, Series A, January 14, 1918.

[19]Max L. Marshall, ed., The Story of the U.S.Army Signal Corps (New York. Franklin Watts, Inc.,1965), pp. 157-166

[20]Dulany Terrett, The Signal Corps: The Emergency (Washington D.C.. Government Printing Office, 1956), p. 34

Visual. All headquarters in a division, to include infantry companies and artillery batteries, were supplied with projectors and flags. Unfortunately, experienced army signalers often found themselves on a battlefield covered with dense projectile smoke. Flags were useless in a situation like that. Each infantry and artillery headquarters, to include battalions, were furnished with command post marking panels and signal panels for use with aeroplanes. This was a common method for ground-to-air communications.[21] All Infantry companies were furnished with front line marking panels. Pyrotechnics were authorized at all infantry and artillery units.[22] The AEF adopted the French pyrotechnic system which included the use of signal pistols, rifle lights, rockets, and position or ground lights.[23]

THE DOCTRINE

A reprint of a British pamphlet by the America's War Plans Division in May,1918, entitled Inter-Communication in the Field, gave the Signal Corps a communication doctrine model to employ the agencies of signalling described above. The pamphlet outlined the requirements for a good system of communications which were reliability, speed in transmission, simplicity, and the ability to meet the demands of a changing tactical situation without confusion and with use of minimum resources. It further stated,

[21]David Woods in his book, A History of Tactical Telecommunication Techniques (p.251), indicates the common method for ground-to-air communication was by means of crossed white panels laid on the ground. These panels, called "paphan" panels, were read easily and quickly by pilots. The aeroplane sent messages to the ground by colored lights. A white light could mean "I am over the target," while a red light might signify "The range is too long." The code was quite limited and required coordination in advance.

[22]War Department, War Plans Division, Inter-Communication in the Field (1918), pp 45-48.

[23]Woods, p. 103. Also Captain J.D.B. Lattin, Signal Corps, wrote in a detailed 11-page article "French Signal Communication Maneuvers at Camp de la Courtine, Creuse France," The Signal Corps Bulletin 32 (January, 1926), p. 21, that "The French make use of pyrotechnics as we do."

> Experience has shown that the establishment by the Signal Service of a system of main centres of communication, connected to each other by numerous and reliable communications, is the only method which fulfills the above conditions To these centres regimental formations which are provided with their own intercommunication link themselves up by the shortest and safest route...The principle of concentrating on main communication centres connected by main arteries of communication remains constant in all circumstances, but the size and number of these centres, and the methods adopted for establishing and protecting them and of connecting them to each other vary according to whether they are employed, in stationary trench warfare, attack from our own trench system and slow advance under trench warfare conditions; or rapid advance, open warfare....[24]

In an area liable to heavy shelling, communications were organized on a divisional basis, "the communication centers being arranged so that there is one main artery of communication from front to rear per normal front of a division in the attack." This single "axis of liaison" served as the focal point for interconnection of the divisional communication's system. The infantry tactical and command communication lines, together with artillery liaison lines, formed in effect a separate telephone system coordinated and directed by a single authority, the Divisional Signal Officer.[25]

In stationary trench warfare, the primary methods of communication were by wire: telephone and telegraph. The governing factor controlling the communication system was the telephone.[26] To ensure communications between centers and units under all circumstances, burying of the main telephone cables six feet deep was stressed. Overland telephone lines required by units and formations were to use the full protection afforded by trenches. Where trenches and ditches were not available, the risk of wire

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[24]War Department, War Plans Division, Inter-Communication in the Field (1918) pp 9-10

[25]Ibid., pp 11-22

[26]In a address by MG J.G.Harbord, Chairman of the Board, Radio Corporation of America, to the New York Society of Military and Naval Offficers of the World War on 5 December, 1933, he states that this was so because officers of the Army were most familiar with the telephone, both from its commercial and social applications

being cut by artillery fire was diminished by placing the line in narrow trenches ten inches deep and ten inches wide.[27]

Recognizing the vulnerability of telephone communications, doctrine dictated the use of alternate methods between communication centers. The pamphlet stressed, "In the event of an attack on a large scale ... the telephone ... in the forward area must be regarded as an *unreliable* means of communications, and success...depending on other methods of communications." If the terrain allowed, a visual signal center would be established to maintain communication with neighboring centers. The general scheme for wireless governed the use of the Power Buzzer and Amplifier in a particular corps and army . "Message carrying agencies" organized to supplement telephone communications between centers were runners, mounted orderlies, dispatch riders, carrier pigeons, message-carrying rockets or projectiles and messenger dogs.[28]

In open warfare, the general principle to be followed was the establishment of communication centers provided with "as many means of transmission as circumstances [would] admit." These centers, positioned close behind the leading units, relied on visual signalling, portable wireless sets, mounted orderlies, message carrying rockets and runners. It was expected that only one main telephone route along the line of advance would

[27]War Plans Division, Training Pamphlet No. 6-A, Trench Line Construction (1918), p. 11. Chapter II, "Wire Trench and Trench Line Construction," specified five types of construction employed for wire trenches based on local conditions. The types varied in depth and width according to the number of lines the trench was to carry and the amount of protection required. They ranged from 10" wide X 10" deep, to 36" wide X 36" deep. These protective measures afforded considerable protection from shell fire, except for a direct hit in or very close to the trench, and also avoided damage to lines due to trench traffic.

[28]War Department, War Plans Division, Inter-Communication in the Field (1918), pp. 14-15.

be available; it being extended to the advance report centers of infantry brigades when the division deployed for action.[29]

A TEST

The German breakthrough at the Chemin-des-Dames on 27 May, 1918, followed by a rapid advance to the south toward Chateau Thierry, created the Soissons-Chateau Thierry-Reims salient. This situation required immediate action by the allies to halt the German advance. Therefore on 29 May, 1918, the American 3d Division commenced movement into the Chateau-Thierry region with instructions to occupy a defensive sector along the southern bank of the Marne River from Etampes just west of Chateau Thierry to the Jauigonne Bend, a distance of nine kilometers on an east and west line, or almost 12 kilometers measuring along the river bank. On its right the 125th (French) Division occupied the adjacent sector; on the left was the 39th (French) Division.[30], Once in place the 3d Division was under the VI French Army.

The first element of the Division to arrive was the 7th Machine Gun Battalion on the afternoon of 30 May. In the days that followed, other elements of the division occupied the newly established defense line. This included the divisional field signal battalion. By the end of June all four of the 3d Division's infantry regiments were in sector side by side. They were the 4th and 7th regiments of the 5th Brigade, and the 30th and 38th of the 6th Brigade. The 3d Field Artillery Brigade consisting of the 76th Field Artillery, the 10th Field Artillery and the 18th Field Artillery began

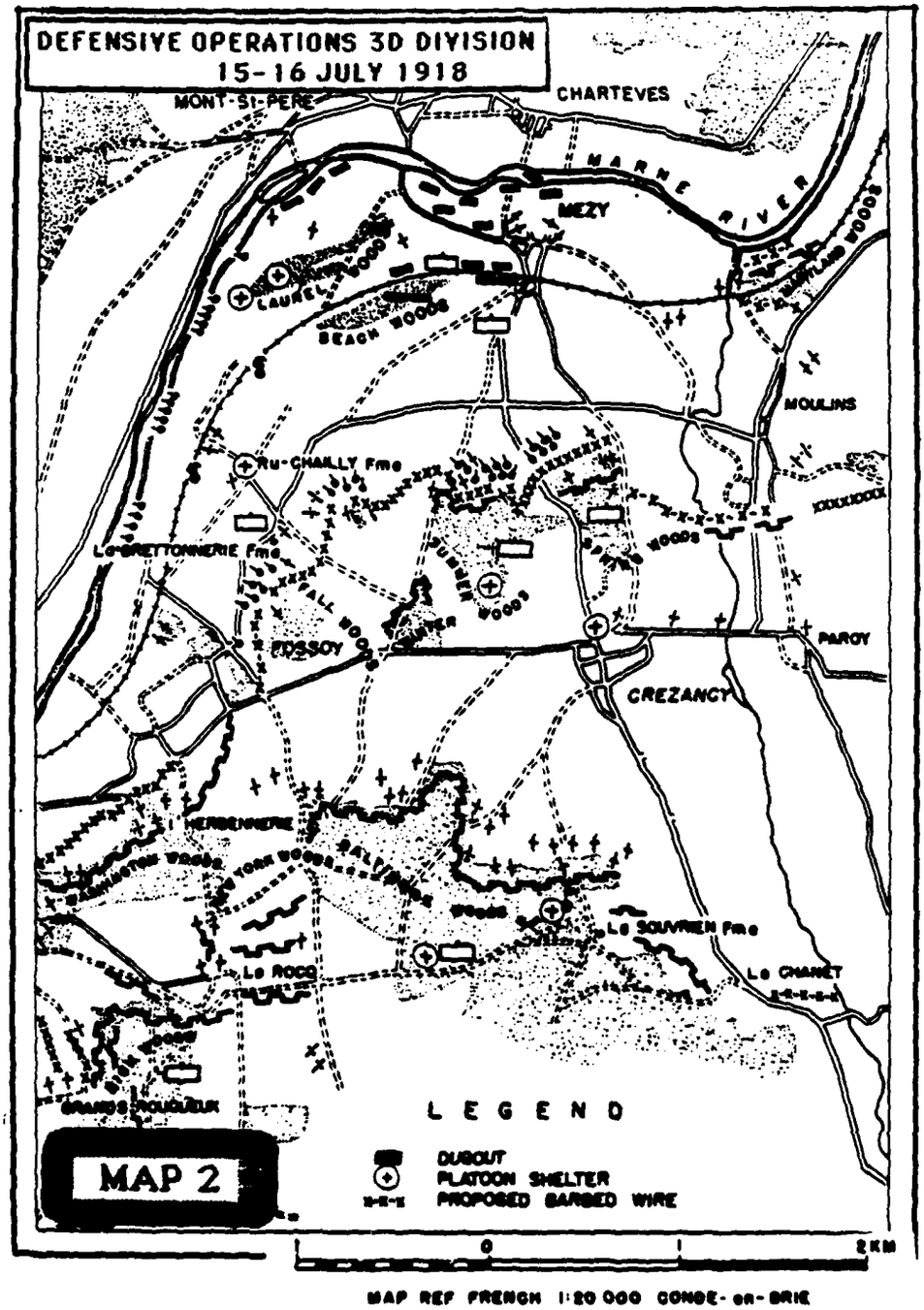
[29]Ibid., pp. 53-54
[30]Divisional Historician, History Of The Third Division United States Army In The World War (Andernach -On-The -Rhine, 1919), p. 7.

arriving on 3 July with the last battalion arriving as the German artillery opened fire around midnight on the 14th.[31]

Under a plan of deliberate defense, published as Field Order No.7, the sector took shape.[32] Four general lines of defense organized the sector. A line of observation with isolated pits and machine-gun emplacements extended along the river bank. Next followed a more strongly garrisoned defensive position known as the Railroad Line that extended along the railroad embankment of the main line to Paris. Behind these two lines, the primary line of resistance, designated the Aquaduct Line, extended along the slopes of the first hills of the Marne. The regimental reserve line, designated Woods Line, followed the forward slopes of the second ridge south of the Marne, and extended into the Surmelin Valley on the east. A fairly well organized reserve battle position known as the Army Line followed the reverse slope of this second ridge. A bretelle position extended northeasterly from this reserve battle position to the regimental reserve line in the 7th Infantry sector; another in a northwesterly direction into the French sector on the right.[33] On 14 July, the defensive works were still under construction, and in fact, were

> ...in a rather elemental state, due to several circumstances, the most important of which were the more or less open character of recent fighting, the lack of engineer personnel, and the constant shifting of units in the early stages of organization, and the continual changes in sector limits, occasioned by the Army Corps organization and reorganization...Dugouts for use as P.C's and dressing stations and a number of splinter roofs had been installed. Fire trenches existed along the front edges of the

[31]Ibid., pp 3-7
[32]Appendix A of this thesis is the Annex No. 5, Signal Annex, to Field Order No.7, 3d Division, 2 July, 1918, relating to signal communications for the defense of the sector
[33]Divisional Historician, History Of The Third Division United States Army In The World War (Andernach -On-The -Rhine, 1919), pp 7-9



SOURCE. Historical Division, Department of the Army, United States Army In The World War 1917-1919, vol. 5, Military Operations of the American Expeditionary Forces, Champagne-Marne, Aisne-Marne (Washington, D.C., Government Printing Office, 1948), p. 63

woods and at certain isolated points, but were of not sufficient depth to afford reasonable protection from shell fire [34]

Fifth Field Signal Battalion

The Fifth Field Signal Battalion, Signal Corps, organized at Fort Leavenworth, 26 June,1917, spent months prior to its deployment overseas "in intensive instruction, and in the equipping and training of the Battalion for the acid test of battle." Assigned to the 3d Division, it departed for overseas duty from New York Harbor at 6:50 P.M. on 27 February, 1918, and arrived Pontanezen Barracks, Brest, France, at 12:30 P.M. on 11 March.

On 16 March the battalion "entrained" at Brest and subsequently reported for duty with the Third Division on the 19th. The radio and wire companies were billeted at Marnese, and the outpost company at Asy le Pont. The non-availability of construction personnel in the area resulted in the employment of the Fifth Signal Battalion in the construction of a base hospital during its first month with the division. Not until 15 April did the unit begin familiarization training on the installation and operation of the French signal equipment which they had been issued.[35] Training consisted of a week of 'hands-on' experience with the new equipment, and field problems then followed. This was an intensive training period. The battalion practiced with the buzzerphone, French monotype switchboards, French signalling lamps, and other equipment. Trench stake line and buried cable routes were constructed, and lance-pole lines were built to neighboring units. In the field, all prescribed methods of signaling were practiced and evolving methods tested. The instructors detailed a situation,

[34]The General Service Schools The General Staff School 1921-1922. Campaign of 1918 Americans At Second Battle Of the Marne. "Special Report Operations of the Third Division, 15-31 July, 1918. Second Battle of the Marne." The General Service Schools Press Fort Leavenworth, Kansas 1922. p 5

[35]Divisional Historician, History Of The Third Division United States Army In The World War (Andernach -On-The -Rhine, 1919), pp 285-288

outlined a course of action, then assigned duties to the signal company for execution. Actual construction and installation of their defensive position s communication requirements furnished the practical application phase of their training. [36]

On 30 May, the battalion left Marmesse, France, arrriving at the la Charmois Farm on the following day. At first, the French controlled all communications since the 3d Division deployed piecemeal among the Allies. During this period the divisional signal personnel operated at a handicapped. Far too often they were not informed where, and when, the American battalions were being sent. Furthermore, to maintain contact with the deployed units, mobile telephone equipment had to be borrowed from the French. The gradual consolidation of the division prior to 14 July finally allowed 3d Division's signal personnel to interconnenct all units with communications.[37]

Ordered to take up positions at Chateau Thierry with Division Headquarters at Viel Masion, the Fifth Signal Battalion installed a divisional telephone system.[38] Telephone and radio connected with the125th French Division on the right and the10th Senegalese on the left.[39] Telephone wire connected all headquarters, extending as far forward as front line

[36]War Department, Office of the Chief Signal Officer, Report of the Chief Signal Officer To The Secretary Of War 1919 (Washington, D.C.: Government Printing Office, 1919), pp. 376, 386.
[37]Ibid.
[38]S.H.Mudson, Extract from Personal Narrative No. 914, Narrative of Events, Operation Marne," France, 1919. (Typewritten). Captain Munson states "...upon arrival in this sector we found no communication and the 5th Signal Battalion laid a complete Divisional telephone system, from Division to Brigades all lines were built on poles and stake lines, from Brigades all lines were laid on the ground and in the fields and thru woods the shortest possible routes to the regimental P.C. so [sic] as to clear all road traffic during the month of June 1918 a Canniveaux was dug from La Rocque Farm to Vifford lying the wires of the Brigades and three Regiments.
[39]Thomas L. Clark, "Extract from Personal Narrative No. 1023, Narrative of Events Operation Marne," France, 1919. (Typewritten). Major Clark, Signal Officer, assigned Fifth Field Signal Battalion

companies and observation posts; also laterally between infantry regiments, some artillery batteries and echelons to their rear. In the 30th and 38th Infantry regiments and in the battalions of the 10th Field Artillery, laddered back-up lines provided redundancy and added protection from breaking.[40] Two or more wire circuits extended to the rear from infantry regiments. Both the infantry and signal personnel duplicated the lines laid by the artillery to support infantry units. Forward areas employed both buzzers and buzzerphones. Ground telegraph sets established wireless communication between the regiments and their battalions. Radio connected the infantry regiments with the rear as well as supporting artillery. Visual stations, with visual relay stations where necessary, provided lamp communications from front to rear, laterally, and from rear to front if concealed from the enemy. Pyrotechnic signals provided for requesting artillery fires or acknowledging visual or panel signals. Panel crews operated at brigade and divisional command posts. Pigeons were distributed to forward units, and two A Company, Fifth Field Signal Battalion men provided liaison support to the french lofts. Runner lines and runner relay posts provided back-up if all other means failed. There seemed every reason to expect that adequate signal communications would be maintained in case of attack.[41]

[40]War Department, Office of the Chief Signal Officer, Report Of the Chief Signal Officer To The Secretary Of War, 1919 (Washington, D.C.: Government Printing Office, 1919), p. 391. Laddered construction of telephone lines was first adopted for use in May, 1918 by the Second Field Signal Battalion in the Cantigny operation. This consisted of six lines for the regiment, to be laid in two sets of three wires each with one set for each assault battalion. The termed "laddered" was used to describe the cross wires which, at a distance of 75 feet, connected the three wires of each set laterally

[41]S.H.Mudson, Extract from Personal Narrative No. 914, Narrative of Events, Operation Marne," France, 1919. (Typewritten)

THE 3D DIVISION IN THE DEFENSE

At approximately 0010 hours, 15 July, 1918, the German artillery preparation fell on all parts of the 3d Division's sector, to a depth of seven miles, but with particular intensity against the regimental reserve position of the two center regiments, the 7th and 30th, and their immediate rear area. The results on the installed wire and radio system were devasting.

Every wire circuit in the division appeared to be cut during the first few minutes of the bombardment. In spite of the effort of the signal repairmen, lines were shot to pieces faster than repairs could be made. Of the sixteen linemen attemping repair, all were either killed or wounded.[42] Communication by wire, at least in the three eastern regiments, with their supporting artillery, became impossible except for short periods of time. The infantry and artillery were able to partially use each other's circuits due to the extensive interconnection between the two systems. The division's main wire axis was completely severed, time and again. Communication by telephone with advance units of the division was virtually nonexistent until 1200 hours, and wire communications were unsatisfactory throughout the days of the15 and 16 July.

Radio fared a little better, despite the poor operating conditions. Accounts show the need for radio communications when wire failed, and the lack of its use for command purposes when wire was available. Aerials were continually shot down and the bombardment destroyed the 7th Infantry's set and rendered the 30th Infantry's set initially useless. Additionally, the bombardments brought up static clouds, thus adding to the jamming of the other stations. Failure of wire communications resulted in

[42]Thomas E. Hunt, "Extract from Personal Narrative No.679, Narrative of Events, Operation Marne," France, 1919 (Typewritten).

net congested with messages being transmitted in the clear. Most of the messages sent were of an emergency nature calling for water, reinforcements and action against new moves of the enemy.[43] The natural inclination of the American ground commander to depend upon the telephone, at the expense of not using the radio, was evident even when shells had cut the wires and radio was the only means available. Radio was seldom used under any circumstances, except for text messages. In the St. Mihiel offensive it would not be uncommon to receive the message from a brigade commander on the radio, "I am absolutely out of all communications." The ground telegraph wireless sets used in the forward areas, when not destroyed, were unsatisfactory since their low toned signals could not be heard over the noise of the bombardment. In spite of satisfactory radio communication, its newness and the requirement to use codes and ciphers, prevented full advantage of its availability. Nevertheless, it seems that radio carried the bulk of the traffic not carried by messengers.

Visual signalling appears to have been a complete failure. The artillery fires destroyed the 7th and 30th Infantry's command post. No messages seem to have gone through in other parts of the system; at least no mention is made anywhere of visual messages being successful. Rockets and other pyrotechnic signals between infantry and artillery units were a dismal failure. The Germans across the Marne kept the area lighted with their own rockets, thus making an attempt to signal with rockets impossible from the front lines. Information provided by a carrier pigeon of the German attack in the 38th Infantry sector was relayed forward by telephone during one of the periods when it was working. This use of the

[43]C A Peregrine, "Extract from Personal Narrative No 142, Narrative of Events Operation Marne," France, 1919. (Typewritten). Second Lieutenant Peregrine was a signal officer assigned to the 3d Division.

pigeon with combat troops marked the beginning of their effectiveness in getting messages through when under means failed. Available sources make no mention of any messsages by panel during this two day period. Runners became the chief means of signal communications. In the 30th Infantry, as was the case in the other two regiments in the path of the German attack, this was the only means for reliable liaison generally available.

OBSERVATIONS 14-15 JULY

Available records do not show that signal communications within the 3d Division, other than by wire, significantly improved prior to the counterattack and their subsequent advance to the north bank of the Marne on 18 July. Some organizations profited by earlier mistakes and succeeded in establishing better wire communications. The main wire axis of the division had been installed on poles and supports along main highways and built-up areas. Between the vehicular traffic breaking down the supports, and bursting shells repeatedly severing circuits, the wire axis gave unsatisfactory service. Five circuits on stakes installed in a wire trench constructed by the French fared well during the bombardments. Being in a location suitable for a division wire axis, these protected circuits became the 3d Division's primary wire axis. This generally eliminated the wire communication problem. Later, profiting by the unfavorable experiences with lines located in high trafficability areas, the Signal Corps avoided them. The Marne Operation during the German offensive was,

> ...the most trying test the Signal Corps had met. Regiments had rushed into line where the menace was greatest, had been separated from their brigades....Yet somehow the signalmen managed to keep their units in communication....Every known field-signaling method came into use. If one means was made

inoperative, another took its place, with a Signal Corps man to send the message through [44]

THE 3D DIVISION IN THE OFFENSE

At Chateau Thierry, American divisions stopped the German advance. The Allies began a transition to the offense on18 July, and the Signal Corps was faced with a still greater challenge: the problem of furnishing communications from the front line back to corps during an open warfare advance. The general plan of Marshal Foch was to deliver a stunning blow on the western buldge of the salient. The 3d Division would participate in the second phase of a planned advance.

Generally, the advance was a series of movements with three units participating at one time. In the first phase, the 26th Division, near Chateau Thierry, was the hinge for the movement for the 1st and 2d Divisions, the objective being to move the Germans out of the salient. The successful completion of this phase, allowed the 3d Division to begin it swinging movement at the Chateau Thierry end, thereby providing the link between the two advances. The remaining two units participating in this second phase of the advance were the 28th and 42d divisions.

The 4th Infantry, 3d Division crossed the Marne on 18 July. Signalmen swimming across the river at night, installed two telephone lines to the advance battalion at Gland. Duplicate telephone lines laid over a pontoon bridge near Bleames the next day provided the primary communication for the advances. Again, radio was seldom used. Regiments were "too busy moving forward to bother with the apparatus" and "there was little need

[44]War Department, Office of the Chief Signal Officer. Report Of the Chief Signal Officer To The Secretary Of War, 1919 (Washington, D.C., Government Printing Office, 1919), pp 402-403

for the radio as an emergency means."[45] As the units established bases across the Marne, signal personnel installed telephone and radio communications. Once movement resumed to the north, all lines were laid on the ground and through dense woods, relays stations being established as required. Interconnections between the Infantry and Artillery telephone nets provided alternate message routing capability. This duplication facilitated successful transmission of time sensitive information. "In this way, important messages were put through, [sic] at times when failure would have meant disaster."[46] In twelve days the Fifth Signal Battalion alone had laid 173,611 feet of outside twisted pair No. 17 wire. On 25 July,1918, the 3d Division, less the 6th Brigade with its signal detachment of the Fifth Field, were withdrawn from the line.

The 6th Brigade, acting independently, established headquarters three times during the movement, the last location being the Longville Farm. Lateral communications and communications to the rear were completed as quickly as possible. During the advance toward the Vesle River, wire that was carried forward maintained a continuous liaison between advancing units and the rear with communications seldom out in excess of ten or fifteen minutes.[47] During the installation of wire lines between the Longville Farm back to the old 6th Brigade Headquarters and to the Army Corps, an "incident of interest" occurred. To complete the installation of these particular lines, details of signalmen from opposite directions laid

[45]C.A.Peregrine, "Extract from Personal Narrative No.142, Narrative of Events, Operation Marne," France, 1919. (Typewritten).
[46]Jules E. Gonset, "Extract from Personal Narrative No. 150, Narrative of Events, Operation Marne," France, 1919. (Typewritten). Captan Gonset, Signal Officer was assigned to the 6th Brigade, 3d Division.
[47]Thomas E. Hunt, "Extract from Personal Narrative N0 679, Narrative of Events, Operation Marne," France, 1919. (Typewritten). Captain Hunt was a officer in Company B, Fifth Signal Battalion during the Marne operation

cable. The route, entirely through fields and over unmaintained trenches, masked the movement of the teams from one another. A system of improvised whistle signals coordinated their movement and insured their meeting.[48] Once again the signalman used the limited assets available to ensure mission accomplishment. "This line held in surprisingly well, for in the seven days that it was used, it went out of service but once and that was when a mule knawed it into [sic]."[49]

Again, radio was seldom used, if ever, while the Brigade was at Longville farm. Test messages transmitted everyday by Signal Corps personnel to the Army Corps and 3d Division Headquarters adequately demonstrated its availablity for use as a communications means. However, the brigade commander's preference was to wait until telephone communications were restored rather than transmitt messages by radio. This also held true for the radio communications established forward with the 38th Infantry and the 30th Infantry. Reliability of telephone communications was only fair due to the breakage of wire lines by enemy artillery, yet even in periods of prolonged outages with radio being the sole means of liaison available, its use was nonexistent. Fortunately, the availability of enemy lines supplemented American installed lines.[50]

The 6th Brigade, relieved on 11 August, returned for rest and the Fifth Signal Battalion began wire salvaging operations. But each 3d Division signaller knew that the opportunity to be tested would come again soon.

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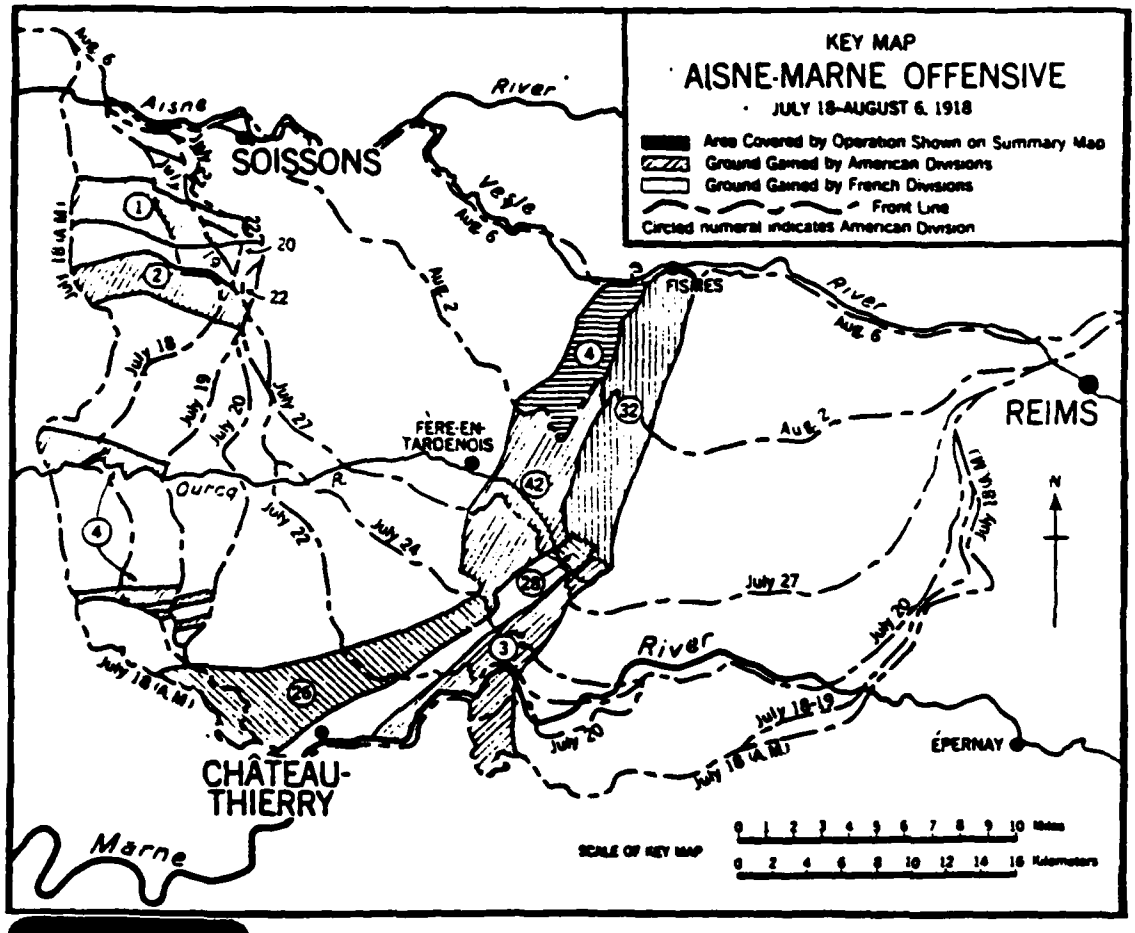
[48]The U.S.Army Signal Book of 1916 offers several paragraphs concerning sound signaling procedures: "Sound signals made by the whistle,foghorn, bugle,trumpet, and drum may well be used in a fog, mist, falling snow, or at night. They may be used with dot-and-dash code."

[49]Jules E. Gonset, "Extract from Personal Narrative No. 150, Narrative of Events Operation Marne," France, 1919. (Typewritten).

[50]Ibid., p.3



MAP 3

SOURCE: American Battle Monument Commission, 3d Division Summary Of Operations In The World War (Washington, D.C.: Government Printing Office, 1944)

CONCLUSIONS

The 3d Division's signal soldiers during the period 15 July-11 August, employed every communication means available under the worst conditions of war. They had transitioned from trench fighting to open warfare. Most important was that the Second Battle of the Marne had given to the 3d Division's signallers, first hand, the communication problems of both defensive and offensive fighting. Wire lines had been cut repeatly, and many mesages delayed. "The varying conditions brought problems which signal officers had to work out in their own way."[51] The preparation of the defensive positions had been intensive, but so had the German bombing.

> At La Rocq the Seventh Infantry's post of command was obliterated. Wires were shreds; the radio and visual stations had been destroyed and both men and material literally blown out of existence.
>
> ..In the telephone dugout of the Third Battalion, Thirtieth Infantry, were 4 signalman, all who remained of 15....The signal section of the regiment had 39 casualties...The visual station had been destroyed, the men killed or wounded, and the apparatus shattered....At the regimental post of command all runners had been killed....
>
> ...A sergeant, corporal, and two privates were the survivors of one battalion detail....Fourty men to replace the section were borrowed from the One hundred and third Field Signal Battalion of the Twenthieth Division, which was in reserve....[52]

The signallers of the 3d Division had demonstrated their determination by maintaining communications to the infantry and the artillery at a high cost. Their lack of training, combined with limited exposure to a combat situation, was evident. Excellent equipment and sound doctrine was not the contributing factors that allowed the division's signallers to meet the changing tactical requirements. The difference was the individual

[51] War Department, Office of the Chief Signal Officer, Report Of the Chief Signal Officer To The Secretary Of War, 1919 (Washington, D.C.: Government Printing Office 1919), p. 417.
[52] Ibid., p. 399

soldier. However, the Meuse-Argonne Offensive was next, and there the signaller, his equipment, and the doctrine that governed its employment would all play an important part in the gaining of the victory over the Germans.

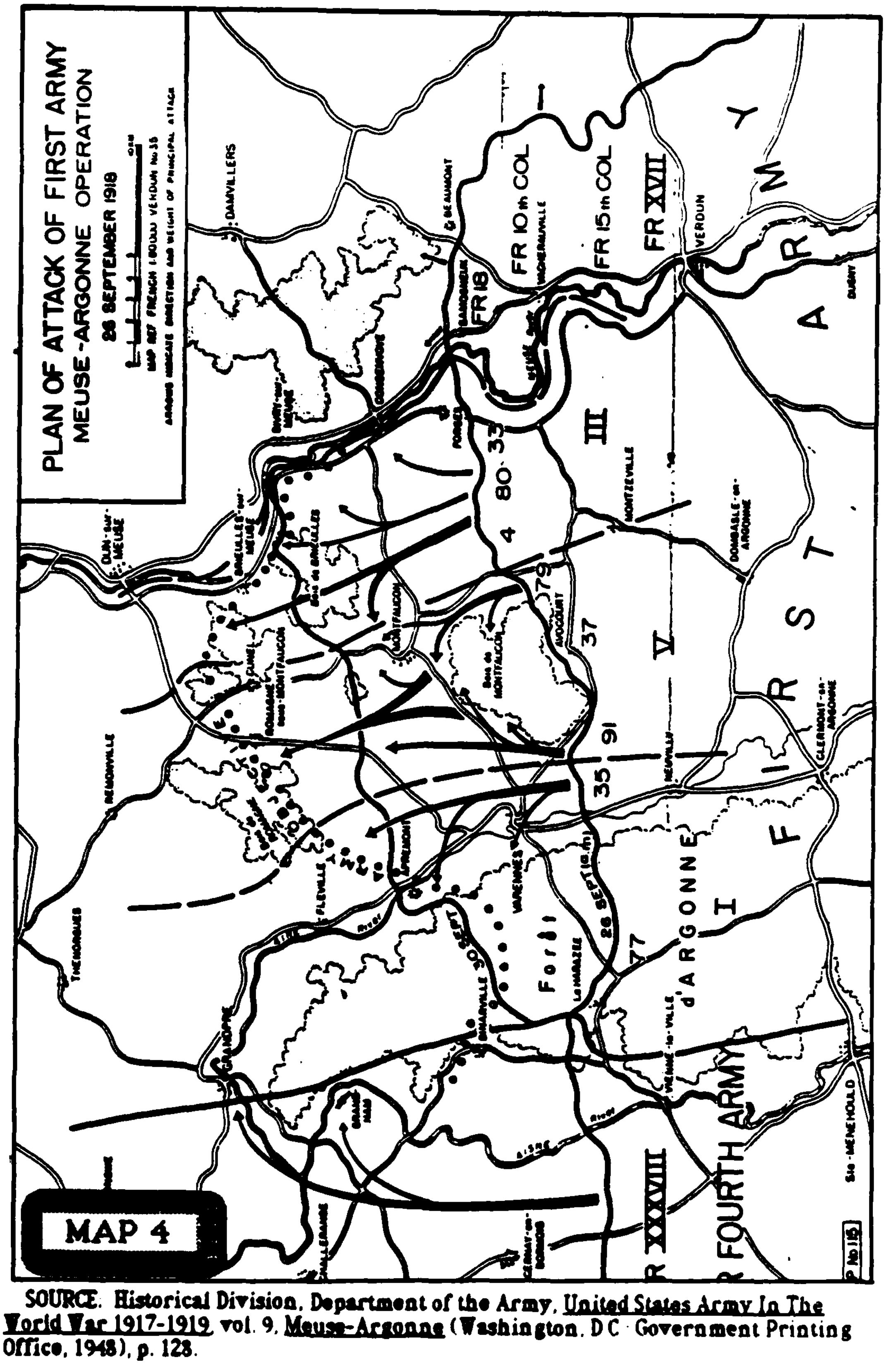
CHAPTER FOUR

A FINAL TEST
TRANSITION TO NECESSITY

BACKGROUND

General Pershing's desire to have a sector of the western front for the American Expeditionary Force had been fulfilled by the assignment of the area from Port sur Seille, east of the Moselle River, to Verdum on the Meuse, and extending to the Argonne Forest's western edge.[1] With the success at St. Mihiel, offensive plans were made for the advance west of Verdum. This included an American attack between the Meuse River and the Argonne Forest beginning September 26th. A " practically stabilized front since 1914, the Meuse Argonne remained unchanged until the 1918 advance. Fours years had allowed the Germans to develop a defensive

[1]According to General Pershing, "The definite decision for the Meuse-Argonne phase of the great allied convergent attack was agreed to in my conference with Marshall Foch and Gen. Petain on September 2. (1918) It was planned to use all available forces of the First Army, including such divisions and troops as we might be able to withdraw from the St. Mihiel front. The Army was to break through the enemy's successive fortified zones to include the Kriemhilde-Stellung, or Hindenburg Line, on the front Brieulles-Romagne sous Montfaucon-Grandpre, and thereafter by developing pressure toward Mezieres, was to insure the fall of the Hindenburg Line along the Aisne River in front of the Fourth French Army, which was to attack west of the Argonne Forest. A penetration of some 12 to 15 kilometers was required to reach the Hindenburg Line on our front, and the enemy's defenses were virtually continuous throughout that depth... The detailed plans for the operations of the Allied Armies on the western front changed from time to time during the course of this great battle, but the mission of the First American Army to cut the great Carignan-Sedan-Mezieres Railroad remained unchanged." The perpendicular distance to the Carignan-Mezieres railroad from the Meuse-Argonne front was 50 kilometers. General John J. Perishing, Final Report Of Gen John J Pershing Commander-In-Chief American Expeditionary Forces, (Washington, D.C., Government Printing Officer, 1920), pp. 43-45



SOURCE: Historical Division, Department of the Army, United States Army In The World War 1917-1919, vol. 9, Meuse-Argonne (Washington, DC: Government Printing Office, 1948), p. 128.

system of "unusual depth and strength and a wide zone of utter devastation, itself a serious obstacle to offensive operations."[2]

OVERVIEW OF SIGNAL COMMUNICATIONS IN THE MEUSE-ARGONNE OPERATION FROM THE FIRST ARMY'S PERSPECTIVE

Restoration of communications over "no man's land" during the first phase of the Meuse-Argonne, 26 September - 3 October, was the first critical obstacle to overcome. The four primary roads across the zones of advance were deplorable from years of artillery fire. The "spongy soil and lack of material," combined with limited transportation assets available to the Army as a whole, and to the tactical signal organizations in particular, placed a strain on transporting signal material in support of the17 kilometers advance that was achieved in this phase.[3] Prepositioning of signal material and equipment in forward supply dumps, combined with the adoption of an "extensive salvaging plan" that yielded large quantities of enemy wire and equipment, had prevented shortages in the recent St. Mihiel Offensive. The Meuse-Argonne Offensive was different. Road congestion after the first attack on 26 September , precluded resupply from the three forward dumps established for the front line divisions. The hasty development of a new dump in the vicinity of the 1st Corps Headquarters, a renewed emphasis on salvaging versus requisitioning, and a complete turnover of the Second French Army lines to the First Army lessened the impact of the shortages.[4]

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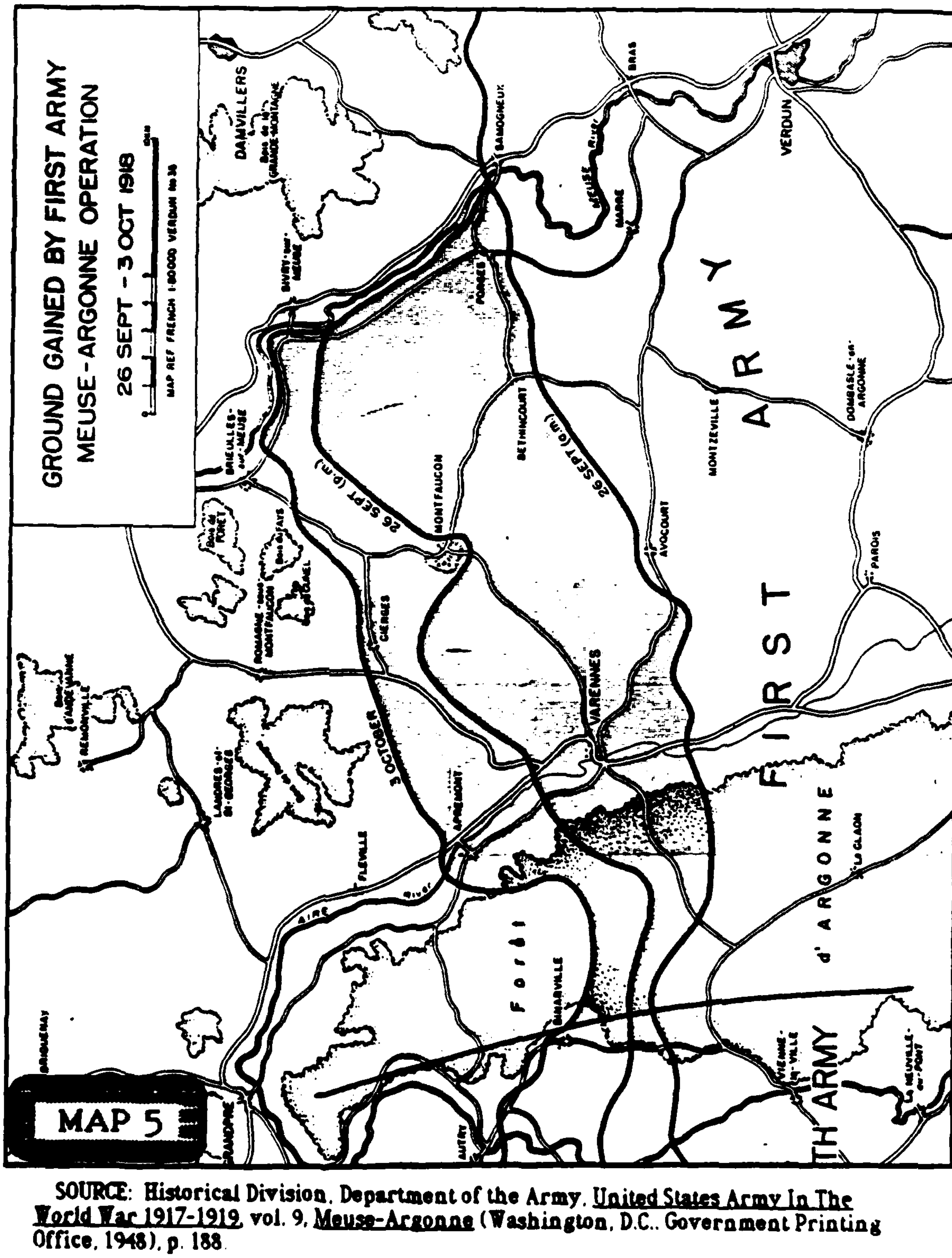
[2]Ibid., p.43.
[3]Ibid., pp. 46-47.
[4]Thirty-two truckloads of Signal Corps' material, consisting primarily of wire, tape and batteries, were placed in this dump. Many divisions entered the sector with incomplete unit equipment. Since contingencies had not been established for such a supply demand, existing stocks were also drawn from many corps and Army artillery units. War Department, Office of the Chief Signal Officer, Report of the Chief Signal Officer To the Secretary Of War 1919 (Washington D.C.: Government Printing Office, 1919), p. 464.



SOURCE: Historical Division, Department of the Army, United States Army In The World War 1917-1919, vol. 9, Meuse-Argonne (Washington, D.C., Government Printing Office, 1948), p. 188.

The second phase, 4-31 October, was a period of continuous fighting that brought the First Army's divisions to "the limit of their capacity." During this period, German resistance on the front increased from an opposing force of 21 divisions to 36. The Hindenburg line was broken and the Argonne Forest placed under American influence. This constituted an advance of 21 kilometers, but at a great cost of personnel and equipment. Replacements were sorely needed to reconstitute the exhausted divisions. Combat units required nearly 90,000 men, yet only 45,000 replacements were projected.[5] The tactical signal organizations, especially, felt the strain. Installation of the wire circuits in the open had caused heavy casualties to the signal organizations of the infantry and artillery.[6] Replacements would be hastily trained men, unfamiliar with both the equipment and its employment.

On the morning of 1 November, the beginning date of the third phase, three Army corps were in line between the Meuse River and the Bois de Bourgogne. Now the task of the Signal Corps became "extraordinarily difficult." Rapid movement over long distances, and under adverse weather and road conditions, invariably caused periodic communication outages. Insufficient motor transportation required signal men to carry supplies in additional to their personal equipment. Small munition carts became transports for carrying field wire, an asset that had become scarce. Use of

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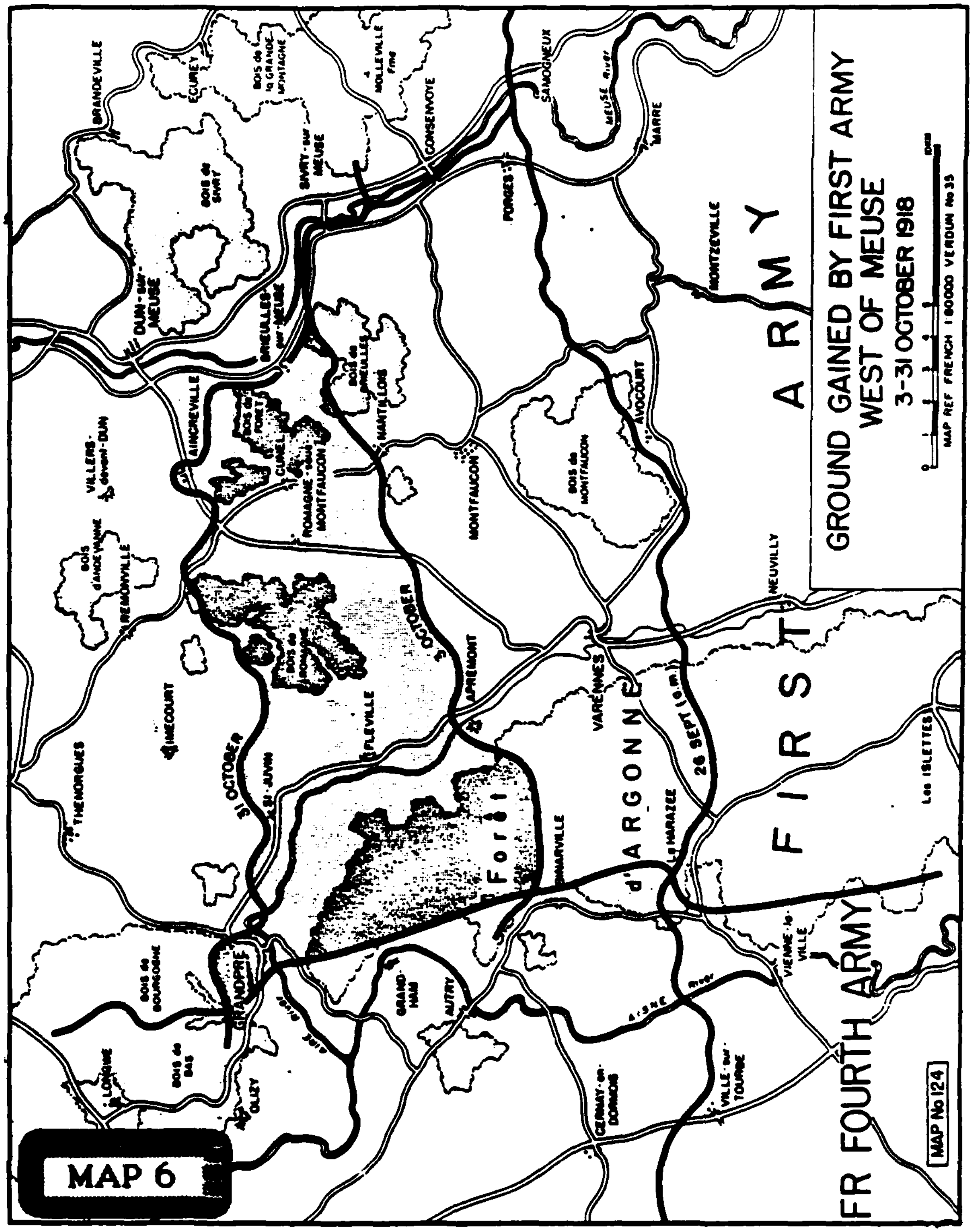
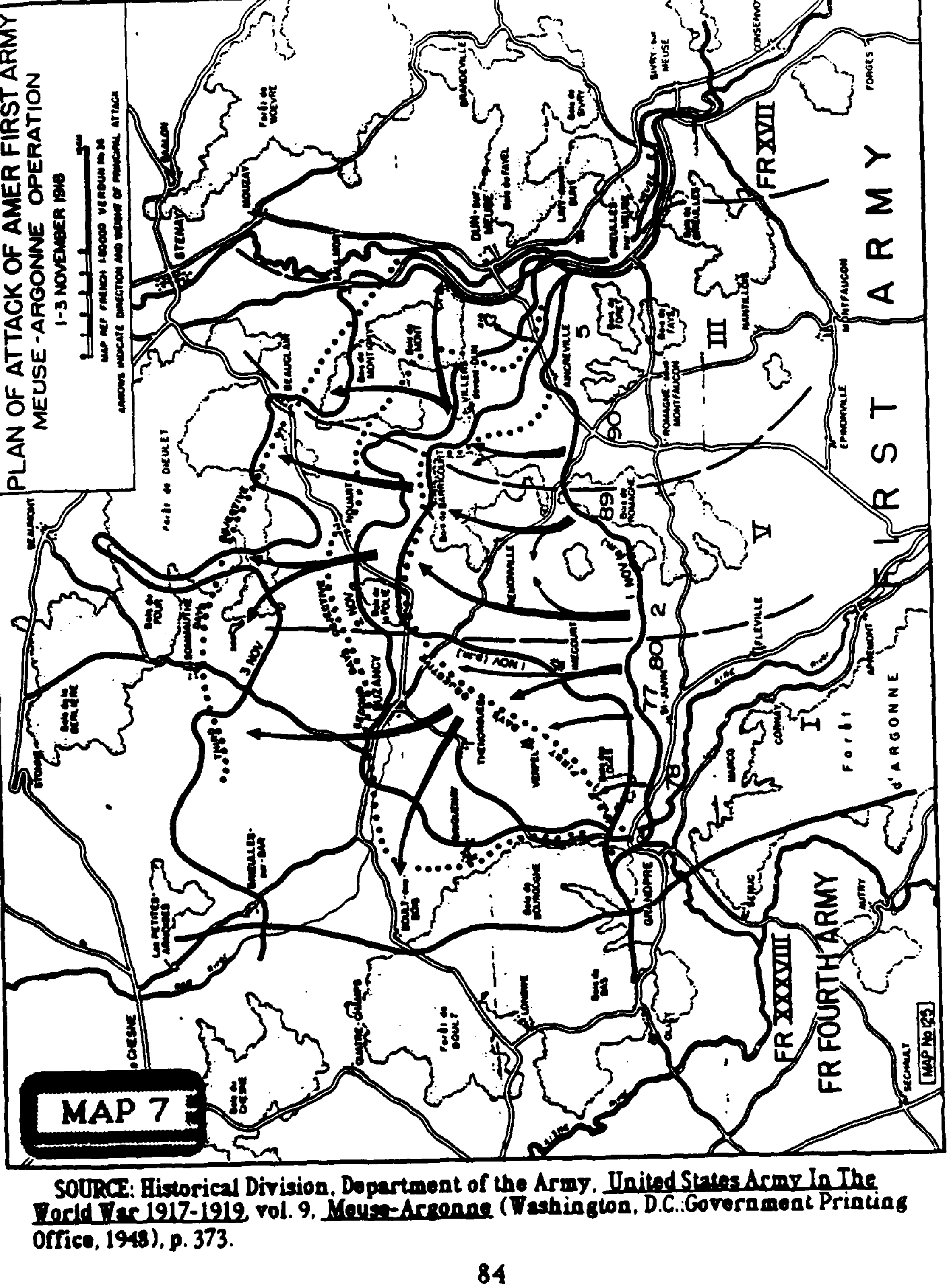
[5]Pershing, pp. 47-50.

[6]"During six engagements, the Fifth Signal Battalion (3d Division) suffered 2,407 casualties of which 279 were killed. The average strength of the battalion was 482. The average casualties per battalion of signal personnel in the 26th Infantry (1st Division) from October 4 to 11, 1918, inclusive, was 74. Since the average strength of a battalion signal detail averages about 20 men, this gave a casualty rate of over 300 per cent in a little more than one week." Captain Fred G. Borden, "Wire And Radio Communication In Combat," The Signal Corps Bulletin 62 (May-June, 1931), p 17



SOURCE: Historical Division, Department of the Army, United States Army In The World War 1917-1919, vol. 9, Meuse-Argonne (Washington, D.C., Government Printing Office, 1948), p. 363



SOURCE: Historical Division, Department of the Army, United States Army In The World War 1917-1919, vol. 9, Meuse-Argonne (Washington, D.C.:Government Printing Office, 1948), p. 373.

German lines compensated for American wire shortages[7] and facilitated establishing communications both forward and to the rear.[8]

Pigeons as a means of communications were especially effective during the advance when all other means failed. In preparation for the Meuse-Argonne offensive, 20 lofts and 1200 birds were transferred to reserve fields. Pigeons carried 403 messages over varied distances with extremely fast flight times. In fact, some of these flights exceeded distances of 60 kilometers. Pigeons carried "some of the most important information received from the front and provided in many cases the first news of objectives reached."[9] The effectiveness of employing pigeons during rapid movement when other means failed, secured a place for this communication's means in the American Army.[10]

OVERVIEW OF SIGNAL COMMUNICATIONS IN THE MEUSE-ARGONNE OPERATION FROM THE FIFTH CORPS' PERSPECTIVE

Lieutenant Colonel Karl Truesdell, in a lecture entitled "Signal Communications in the Argonne-Meuse Operations" given at Fifth Army Headquarters on 26 January, 1919, stated signal support during this operation was not what it should have been. From the Fifth Corps' perspective, the

[7]Wire became the almost exclusive instrument of Army communication. The Meuse-Argonne offensive used it at a rate of 2,500 miles a week. This compared to a U S production rate of about 8,000 miles a month by the close of WWI. George Raynor Thompson, The Signal Corps: The Test (Washington, D.C.: Government Printing Office, 1957), p. 16.

[8]Chief Signal Officer, S.O.S., "Signal Corps Appendix to Report of C.G., S.O.S., to the C and C." France, 28 May 1919. p. 71. (Typewritten).

[9]Ibid., p.79.

[10]In Report Chief Signal Officer 1919 (pp. 338-340), regarding the performance of pigeons during the Meuse-Argonne, it states, "Four hundred and fourty-two American birds were used....No record is available of the actual number of birds lost...not more than 10 per cent...and there is no record of an important message having gone astray. In spite of the fact that frequent changing of loft positions made training problems difficult and weather conditions were extremely unfavorable, the liaison work performed by American birds...more than satisfactory, and certain individual performances nothing short of marvelous."

Signal Corps extended itself to the limit of both its men and material. Within the divisions of the corps, the signal platoon in each infantry regiment consisted of "poorly selected and poorly trained" men. The efforts of the signalmen from the outpost company augmenting each of these platoons were also lacking. The combining of these two elements created a hybrid organization that seemed to be unwilling to, or even ready to, provide "complete and unlimited " tactical communication support to the combat troops. The signal details of the Artillery were no better. The transfer of qualified officers and experienced men to the batteries significantly reduced the artillery's ability to respond adequately to a warfare of movement. "Superhuman efforts maintained but meager communications, tooimperfect [sic] for a liaison that should be complete and never failing."[11]

In the beginning of the offensive, "communications were almost nonexistent." The table of allowances for signal equipment proved "very satisfactory" for position warfare, but failed to meet the requirements of movement warfare. The "leapfrogging" of units required twice as much equipment in order to maintain communications between the division and regimental P.C's. This necessitated acquisition of dublicate sets of equipment either through the supply system or by salvaging, the latter being the most expedient means. Fortunately, early in October, communication service to and within the Corps Zone improved drastically. Two actions ocurred that primarily influenced this improvement. A new plan of liaison was issued to "better meet' the changing tactical communication requirements of an active corps, and for the control of divisions passing in and out

[11]Lecture delievered by Karl Truesdell, LTC, SC. "Signal Communications in the Argonne-Meuse Operations," Headquarters Fifth Army Corps, 26 January 1919

AD-A184 703 THE WAVING OF FLAGS AND TORCHES: A STUDY OF TACTICAL COMMUNICATIONS IN TH (U) ARMY COMMAND AND GENERAL STAFF COLL FORT LEAVENWORTH KS R W VANDIVER 05 JUN 87 2/2

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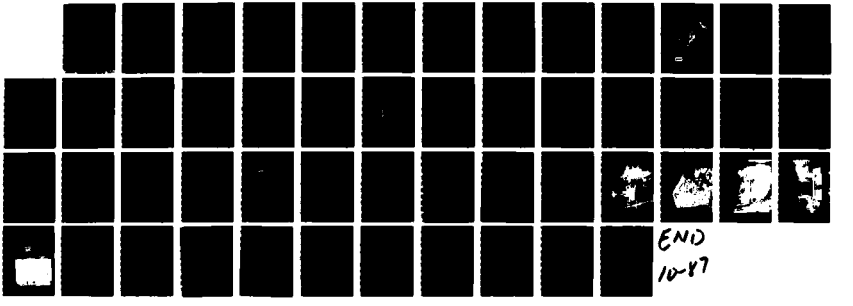

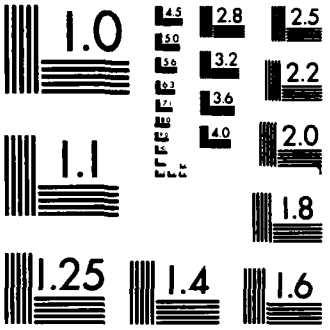

of the corps control.[12] Additionally, stronger emphasis was placed on units establishing the telephone as the "principal means of communications, and all others being auxiliary." The auxiliary systems were radio, telegraphy and visual. Guidelines in this plan for employment of additional means of communications included:

> T.P.S. - (earth telegraphy and conductivity)-after assault, sending and receiving stations to be maintained within the infantry regiments. After stablization, sending sets to include front line companies and advance posts....When divisions failed to advance, or advanced only on limited objectives, the requirement that the T.P.S. should follow the front line battalion became ineffective.
>
> Visual - signal lanterns, projectors, shutter panels....Service to include infantry companies, battalions, regiments and brigades, artillery liaison detachments and forward observers. These systems to be coordinated by the division signal officer, each within his sector....
>
> Panels - infantry, artillery, reserve units, and staking out of infantry front line. Pyrotechnics for the use of leading platoons in the front line battalions....
>
> ....Courier service between all message centers. Within regiments-to brigades and to divisions exceptionally-runners. Regiments-to brigades-to divisions-mounted orderlies. Brigades-to divisions-to corps-to Army and between divisions and corps-motor-cyclists....[13]

OVERVIEW OF SIGNAL COMMUNICATIONS IN THE MEUSE-ARGONNE OPERATION FROM THE 1ST AND 3D DIVISIONS' PERSPECTIVE

The personal experience monograph and supplementary statements of Major Lyman S. Frazier, commander of the 3d Battalion, 26th Infantry,

[12]LTC Truesdale further states..."The principles of liaison are of a standard nature and the practice and details remain more or less constant throughout one operation. Therefore, instead of issuing constant plans, annexes of each field order, a single order was prepared which covered in principle all liaisons. Details which would vary with the passage of division changes in auxiliary units and means were arranged under properly aligned appendices and corrections issued as required in the form of addenda. All this was in contradistinction to existing practice both in subject matter and in arrangement. The plan proper contains the salient facts necessary for commanding staff officers, while the appendices included all small details of technical practice and procedure."

[13]Ibid., p. 4.

1st Division, provides a look at the communications support in this "veteran organization." Major Frazier states:

> Battalion commanders had been informed before the battle that their chief duty was to advance but that next to this their most important function would be to keep in touch with regimental headquarters. If these two things were done, the ground gained would undoubtedly be held.
>
> It was understood that the assault battalion was responsible for the wire line as far back as the support battalion. The support battalion would maintain the line to the regimental C.P. The telephone section of the regimental signal detachment would assist in the supply and maintenence of the entire telephone system.
>
> The wire scheme generally employed at that time was called a ladder line. The lines were laid about ten yards apart or at any other distance which would permit a lineman on partol to observe both lines for breaks. At regular intervals these wires were bridged.
>
> The linemen detailed to bridge the wire carried test sets. In order to keep the system working, men were detailed as line guards and patrols. At all times, both day and night, there would be one man patrolling every 500-yard section of wire. These guards would meet.
>
> During the second phase of the Meuse-Argonne offensive it cost the 3d Battalion 74 men to maintain telephone communications, but had we not had communications at all times, the number of casualties that could have been charged to the lack of it might have been 740 instead of 74.
>
> Runners were depended upon entirely for communication between companies, and between companies and the battalion command post. Runners and mounted messengers were depended upon for communication (other than by telephone) with regimental headquarters.
>
> An important message would be sent by at least two runners, one leaving some little time after the other. It was also found advisable to place some distinguishing mark upon runners. When no distinguishing marks were worn, it required that they carry their messages pinned on their blouses in a conspicuous place.[14]

The 3d Division was the III Corps, First Army's reserve when the Meuse-Argonne Offensive opened, but on the 29th was transferred to the V Corps for the purpose of relieving the 79th Infantry Division in the vicinity of Nantillos. The division attacked on 4 October with a 1,500 meter gain. Although the right of the division advanced almost a kilometer on

[14]From the personal experience monograph and supplementary statements of Major Lyman S. Frazier, as cited in, Infantry In Battle, 2nd ed. (Virginia: Garrett & Massie, 1939; reprint ed., Fort Leavenworth, Kansas: USACGSC), p. 193.

the 5th, the left made little progress. Subsequent attacks during the period 6-8 October resulted in no gains. Finally on the 9th, an advance of another 1,500 meters positioned the front line on the northern edge of Bois de Cunel. 10 October brought no success, and on the11th the division's right flank advanced 400 meters with no gain by the left. Passing into the III Corps' area, it relieved the forward elements of the 4th and 5th Divisions in Bois de Foret, and east and south of Cunel. Attacking in the direction of Clery-le Grand on the 14th, it reached the northern edge of Bois de la Pultiere and then advanced another 500 meters on the 15th. Relieved by the 5th Division on 17-18 October, the 3d Division then received the mission to relieve the 4th Division on its right. The Clairs Chenes woods were captured on the 20th, and Hill 297 and Cote 299 were occupied on the 21st. The line advanced about 1 kilometer southwest of Clery-le-Grand on the 23d, and so remained until the 26th. The 5th Division relieved the 3d Division during the night of 26-27 October.[15]

OVERVIEW OF SIGNAL COMMUNICATIONS IN THE MEUSE-ARGONNE OPERATION FROM THE FIFTH FIELD SIGNAL BATTALION'S PERSPECTIVE

From 29 July through 11 September the Fifth Signal Battalion was "at rest, recuperating, equipping and absorbing consignment of replacements." The conduct of division terrain exercises and maneuvers provided the opportunity of refining the skills of the seasoned signal soldiers, and the training of replacements. In compliance with Field Order No. 29, Headquarters Third Division,dated 8 September,1918, the battalion began movement toward the front. The 3d Division moved at night and remained in bivouac during the day. "Lines were constantly entailing considerable effort for

[15]American Battle Monuments Commission, 3d Division Summary Of Operations In the World War (Washington D.C.: Government Printing Office, 1944), pp. 54-95.

signal troops," according to the sketchy reports of this period.[16] Commitment to action did not occur until 30 September, when the Third Division, reserve of the Third Corps, relieved the 79th Division located in the vicinity of Montfaucon. The battalion replaced the 304th Field Signal Battalion as the 5th Infantry Brigade assumed responsibility for the front line, and the 6th Brigade was held in reserve in the north position of the Bois de Montfaucon.[17] The Fifth Field Signal Battalion was now an active participant in the Meuse-Argonne offensive.

A 40-drop switchboard was installed at the divisional command post and the divisional units connected to it. On 1 October, wire lines were extended to the Fifth Corps. "The rains had started again and for four days and nights the brigade and regimental detachments were busy building and maintaining lines which were constantly being broken...."[18] Heavy shelling, combined with installation of the wires lines by hand and that the wire was carried on the backs of soldiers, significantly retarted signallers efforts. Thirty-five versus 65 men of each platoon from the outpost company were attached to each reigment at the beginning of the offensive. The remainder were held in reserve as replacements, switchboard operators or for laying special lines.[19]

The first axis of communications, consisting of two lines of fieldtwisted pair, was planned to go through Montfaucon-Nantillois-Cunel-Bantheville. However, operational necessity dictated a route change to Montfaucon-

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[16] J.J.Wray, Extract from Personal Narrative No. 269, Narrative of Events, Operation Marne," France, 1919. (Typewritten).
[17] Divisional Historician, History Of The Third Division United States Army In The World War (Andernach-On-The-Rhine, 1919), p.7.
[18] J.J.Wray, Extract from Personal Narrative No. 269, Narrative of Events, Operation Marne," France, 1919. (Typewritten).
[19] War Department, Office of the Chief Signal Officer, Report of the Chief Signal Officer To the Secretary Of War 1919 (Washington D.C.. Government Printing Office, 1919), pp. 482-483.

Cierges-Romagne-Bantheville. The divisional signal officer was directed to establish an advance command post at Cierges, therefore he placed a four line switchboard in operation there. Since the 7th Infantry Regiment was using one of the two axis circuits, three additional lines were brought forward. On 10 October, the axis was changed to the original route requiring the extention of two lines; one to the 30th Infantry's switchboard and the other to the 38th Infantry Regiment's command post five kilometers away.[20]

The Fifth Brigade's Command Post moved on 12 October to Ferre-de-la-Madeleine. From this point forward,

> Close cooperation was established between the radio details and the aerial observers, and a visual station was established upon Montfaucon hill as an extra means of transmitting barrage signals. The earth telegraph proved uncertain in the Seventh Infantry Regiment and buzzer phones became useless, as all operators had been lost. Of the 140 men under command of... regimental signal officer, only 40 remained available at the end of the operation, October 26.[21]

In compliance with Field Order No.67, Headquarters Third Division, the Fifth Field Signal Battalion was relieved from the front line by the 9th Field Battalion, 5th Division on 30 October. From this date until the signing of the armistice, satisfactory signal support was maintained to meet daily requirements. After the signing of the armistice, the Third Division was designated a unit of the Army of Occupation. Transported by bus into camp at St. Maurice, France on 13 November, it was connected, using captured German wires. As part of Third Army, it began its advance from the Meuse to the Rhine on 17 November. Radio communications were maintained throughout the march, and intercommunications within the Division

[20]Ibid.
[21]Ibid.

at each bivouac area provided "excellect service" to its brigades and regiments.

OVERVIEW OF SIGNAL COMMUNICATIONS IN THE MEUSE-ARGONNE FROM THE 3D BATTALION, 18TH ARTILLERY, 3D DIVISION'S PERSPECTIVE

The 18th Field Artillery sailed overseas in March, 1918 as a unit of the 3d Division.[22] Having now participated in the St. Mihiel offensive and the Second Battle of The Marne , the 18th Field Artillery "had been well shaken down." On 24 September, the 3d Battalion established its command post north of Esnes and positioned its batteries in the town. Records reflect primary dependence on wire during this period, with radio providing the meteorological data required for calculation of firing data. Other transmissions were "strictly forbidden," to reduce the possibilities of compromising the upcoming attack. Radio operators at the battalion command post maintained listening silence, recording all intercepts for inclusion in the daily intelligence report. Two, 4-drop monocord boards connected in parallel constituted the battalion's command post switchboard. Connected to the board were wire lines from each battery, the brigade command post, a battalion outpost on Hill 304, and another of the regiment's battalions.[23] This wire system provided reliable intercommunications between each of the elements, and the lack of enemy shelling facilitated maintenance.[24]

[22]The U.S. Army field brigade of an infantry division in 1917-1918 consisted of one regiment of 155-millimeter howitzers and two regiments of 77-millimeter guns. The 18th Field Artillery was authorized 155-millimeter howitzers.

[23]According to Gardner "the battery telephone system, which was their main method of communication, was practically standard at each firing battery. The network consisted of one interbattery line, one line to the battalion, one to the battery executive, and one to the battery commander. John H. Gardner, "Signal Communication In A Battalion Of Field Artillery During The Meuse-Argonne Offensive," The Signal Corps Bulletin 54 (May-June 1930), p. 43.

[24]Gardner, pp. 33, 35-36.

Seven lines ranging in length from 100 meters to two kilometers were installed by hand. The hand reel carts and the breast reels originally issued for expending wire had proved to be ineffective. The breast reels carried too little wire to complete normal wire runs, and the hand could lay and recover wire faster without the use of the hand-cart. The adapted method for laying wire was first to coil on an iron reel approximately 600 meters of twisted pair wire. A light iron bar placed through the center then allowed two men "start out at run," therefore laying wire as fast as their pace would allow them. Installions requiring multiple reels were provided by two detail men following directly behind. Recovery of serviceable wire was expedited using the same modified equipment by two men holding the reel while the third rotated the reel by hand, winding up the wire as fast as the men could walk.[25]

On 3 October, the battalion advanced toward Montfaucon.[26] Arriving on 4 October, the battalion occupied a small draw west of the town. The battery positions were on the reverse slope approximately 600 meters from the battalion command post. Priority of installation mandated hasty wire connection with the batteries first and then with the regiment. Since the 1st Battalion was 700 meters closer to the town and already in contact via wire with the regiment, communications were established by laying to the 1st Battalion. While it was doctrine for higher to lay to lower, interconnection was never delayed if quicker alternates were available. Eight lines

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[25]Ibid, p.36.

[26]"The 2-horse buckboard which was part of the equipment of battalion headquarters was converted into a traveling command post. In changing positions it was loaded with the maps...as well as a camp telephone, three EE-5 telephones, the two 4-drop switch-boards, and four or five reels of wire....The radio had its own wagon. Two members of the telephone detail rode in the buckboard and one, mounted, rode with the communications officer. John H. Gardner, "Signal Communication In A Battalion Of Field Artillery During The Meuse-Argonne Offensive," The Signal Corps Bulletin 54 (May-June 1930), p.37.

were terminated in the switchboards. The battalion commander ordered immediate installation of an outpost line on the Montfaucon's heights. Distance between the battalion command post and the outpost exceeded 1,800 meters. Unforunately, the line route crossed highly congested areas of vehicles and troops. Outages of this line were primarily caused by friendly movement versus enemy shelling. An alternate circuit to regimental headquarters from the outpost insured continuous communications.[27]

The radio station established 50 meters from the command post provided "routine" meteorological data and time signals. The distance between the battalion command post and the batteries rendered visual signalling ineffective. Mounted messengers were dismounted since the regimental command post was two kilometers away. Runners were used to carry maps, reports, and firing data to the batteries. In accordance with current doctrine, a runner from from each battery was present for duty at the battalion command post. These runners normally assumed responsibility to transport the daily firing programs from regimental headquarters to each battalion commander.[28]

Movement of the battalion 1 kilometer west of Cierges, approximately 7 kilometers from their last position, occurred on 12 October. A marked increase in enemy shelling, combined with adverse weather conditions, resulted in constant troubleshooting of the lines to resolve the periodic outages that occurred. Continuous enemy observation by balloon prohibited any visual signalling in the area. Employment of radio was as usual with one exception. Attempts to adjust fire with aeroplane proved to be effective. Communications between air and ground via radio, and then by

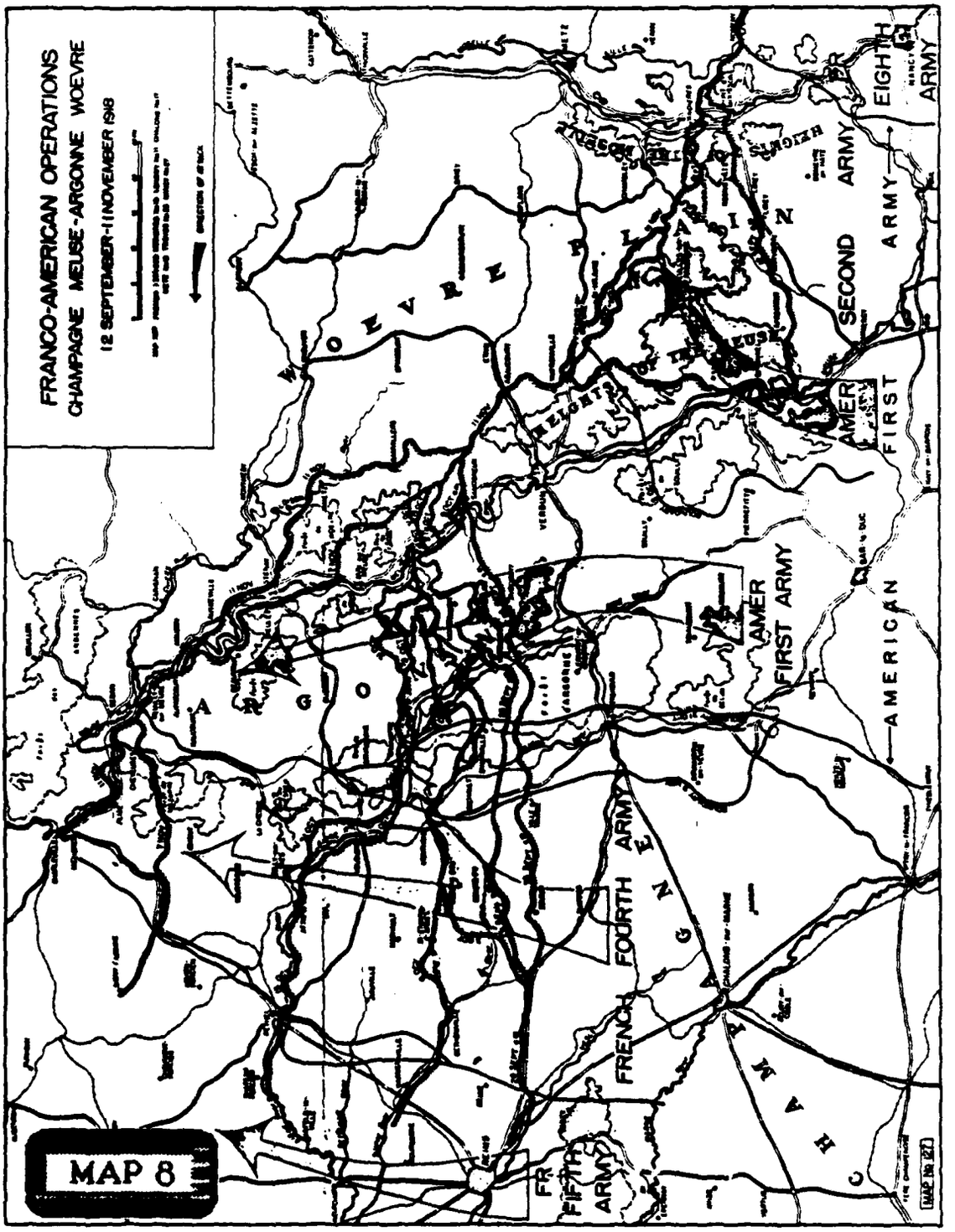
[27]Ibid, pp. 37-38.
[28]Ibid, pp. 38-39.

wire to the batteries was "entirely satisfactory." Mounted messengers again carried mail, reports, maps and orders between regimental and battalion headquarters.[29]

The battalion relocated its positions continuously during the period 22 October through 11 November. First the battalion moved to an area 4 kilometers to the east of Cierges, between Nantillois and the Meuse. Here, use of captured German wire and a complete Zeiss projector facilitated communications with the regimental headquarters and the batteries.[30] The battalion advanced to a position on the Ville-aux-Bois farm near Cunel on 26 October. Installation of wire lines and radio was as usual with the exception of breaks in the wire caused by shelling and traffic. At this point, however, shortages of horses mandated that messengers use bicycles. Unfortunately, this also required that messengers use roads, thereby increasing the liklihood of their death. Such was the case here. Movement to Brieulles on the Meuse, and then across the Meuse at Dun to locate a position near Murveaux, was controlled by the use of motorcycle couriers and limited telephonic communications. "News of the armistice was received just as the batteries were finishing their firing program at 7 a.m. on the morning of 11 November."[31] On 12 November, as part of the regimental column, the 18th began its march with the 3d Division into Germany.

It is during this period,13 November to 17 December, that radio "came into its own as a means of communications." Because of rapid movement, combined with the distance between battalions, laying of wire was time

[29]Ibid, pp. 39-40.
[30]Gardner states that a complete Zeiss projector was found in a german command post, together with batteries and a set of colored bulbs. The lamb was approximately 12 centimeters in diameter. It had a small telescopic sight mounted on it. This projector was set up as the emergency means of communications back to the regiment, since only one wire line connected the two command posts.
[31]Ibid., pp. 40-42.



SOURCE: Historical Division, Department of the Army, United States Army In The World War 1917-1919, vol. 9, Meuse-Argonne (Washington, D.C.: Government Printing Office, 1948), p. 467.

prohibitive. Radio now became the primary means of transmitting the next day's orders to each battalion.[32]

CONCLUSION

The Meuse-Argonne Offensive provided the Signal Corps its opportunity for final testing under the strain of combat. Transition from the defense to an offense characterized by rapid movement, extended the combat support capabilities of the tactical signal organizations to their breaking point. They were faced with adverse weather conditions, limited by shrinking transportation assets, and restricted by terrain battered from years of artillery shelling. These factors contributed to making this the greatest challenge to the Signal Corps in the World War. But the problems faced were not not limited to just these few.

Tables of Organization and Equipment inadequate to support movement warfare mandated adaptation of existing German lines of communications for American use, and renewed the emphasis on salvaging.[33] The assignment of men as part of permanent signal details facilitated transport and installation of the primary wire axes of communications, but resulted in a degraded quality of installation. Reliance on radio during movement

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[32]"In the march of the Third Army into Germany, radio demonstrated its importance. Limitations placed upon the use of telephone brought radio into prominence, and the efficiency of that type of signal communication was soon appreciated more fully than it had been during combat. Contact between brigades and divisions often depended upon radio, and within brigades radio frequently became the only means of transmit-ting information." Major R.B.Moran, "Powers and Limitations of Radio Communication Within A Modern Field Army," The Signal Corps Bulletin 91 (July - August, 1936), p.35; War Department, Office of the Chief Signal Officer, Report of the Chief Signal Officer To the Secretary Of War 1919 (Washington D.C.: Government Printing Office, 1919), p. 509.

[33]First Lieutenant Frank W. Bullock, "Wire Industry Vital To Industrial War Planning," The Signal Corps Bulletin 66 (May-June, 1932), p. 6. Bullocks provides additional insight into why such actions were necessary. TO&E 's were lacking , but also, "The armistice found the American Expeditionary Forces will less than five day's supply of field wire between them ans a suspension of operations-a problem which, fortunately, did not have to be solved."

evolved to a primary means of communications versus a instrument of last resort. But, unfamiliarity with the equipment resulted in a training/operation problem.[34] Emphasis on non-manpower intensive message transmission means gave the Pigeon Service the opportunity to demonstrate its ability as a viable means. Their employment was more than satisfactory, but inadequate training combined with constant changing of positions, degraded their overall effectiveness. And finally, the ingenuity of the signal soldier ensured reliable, flexible and timely communications support, but at a great cost of manpower and material.

The Report Of The Chief Of Staff U.S. Army To the Secretary Of War 1919, concludes by stating:

> The lessons of this war are many and important. Probably no great industry or activity exists in the country that has not gained, during the mobilization of the resources of the Nation which was accomplished during the war, experience which, when analyzed and studied, will be of great and lasting benefit to it and the Nation. Undoubtly the country has incurred much expense, and has lost many lives on account on the improvisations which were inevitable on account of its lack of preparedness for war, and it is essential that the lessons which have crystallized out of the experience...be heeded and profited by if this tremendous toll of wealth and of life is not to have been in vain.[35]

[34]Captain Fred G. Borden, "Wire and Radio Communication in Combat," The Signal Corps Bulletin 60 (May-June, 1931), p. 19. Borden research reveals that the more rigid the requirements for use of cryptography, the less number of messages were received. When restrictions were removed, as during pursuit, the numbers increased manyfold.

[35]War Department, Office of the Chief of Staff, Report Of The Chief Of Staff U S Army To The Secretary Of War 1919 (Washington D.C., Government Printing Office, 1919), p.241.

CHAPTER FIVE

THE FINAL MARKS.
NECESSITY-THE MOTHER OF INVENTION

> Now that active operations have ceased, I desire to congratulate the officers and men of the Signal Corps in France on their work, which stands out as one of the great accomplishments of the American Expeditionary Forces-the result of a happy combination of wise planning and bold execution with the splendid technical qualities of thousands of men from the great commercial telephone, telegraph, and electrical enterprises of America. It is a striking example of the wisdom of placing highly skilled, technical men in places where their experience and skill will count the most.
>
> Each army, corps, and division has had its full quota of field signal battalions, which, in spite of serious losses in battle, accomplished their work, and it is not too much to say that without their faithful and brilliant efforts and the communications which they installed, operated, and maintained, the successes of our Armies would not have been achieved.
>
> While the able management of the directing personnel is recognized, it is my desire that all members of the Signal Corps, who regardless of long hours and trying conditions of service, have operated and maintained the lines, shall know that their loyalty, faithfulness and painstaking care has been known and appreciated. In the name of the American Expeditionary Forces, I thank them one and all and send to them the appreciation of their comrades in arms and their commander in chief.[1]
>
> General John J. Pershing
> 19 February, 1919

In the preceding pages of this study, I presented in the narrowest sense of the words, the evolution and development of but a small part of the World War I Signal Corps. Its ability, or lack thereof, to respond to the changing communication requirements dictated by the character of

[1] War Department, Office Of The Chief Signal Officer, Report Of The Chief Signal Officer To the Secretary Of War 1919 (Washington, D.C.: Government Printing Office, 1919), p. 11.

warfare existing during America's involvement in the war depended on many factors. The Great War was essentially and inevitably a process of improvisation. As the war progressed, its character changed profoundly. The introduction of new weapons, the development of the aeroplane, the proportion of artillery used to infantry, and the new age of electronics, all contributed to the building of a complex war machine.

Like all major wars, World War I accelerated the evolutionary cycle of technological changes. Upon America's entrance into the World War, three years of intensive fighting by the belligerents had resulted in major changes to their tactical signal organizations, communications equipment, and the doctrine that governed its employment. The Office of the Chief Signal Officer recognized that we were "woefully lacking" organizationally, technologically and doctrinally in comparision with all belligerent powers.

"Neither equipment nor organization had been materially changed as a result of the war which was on going in Europe, nor had methods of training been adapted to conditions which existed overseas."[2] In order to meet the conditions of warfare an entirely new organizational structure was adopted. "The regiments of our small army were very much scattered, and we had no organized units, that could be sent overseas prepared for war."[3] In 1916, regulations provided for one field battalion to each infantry and cavalry division. The distribution of signal troops was then determined by the organization of the combat division. As the war progressed, the division organizations expanded, and initially the tactical signal organizations were not able to adequately support it. A make-shift restructure increased

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[2]Ibid., p. 23.

[3]John J. Pershing, Final Report Of Gen. John J. Pershing, Commander-In-Chief American Expeditionary Forces (Washington, D.C.: Government Printing Office, [1920]), p. 5.

the size of the field signal battalion's outpost company, and provided for reinforcements of communication personnel from the infantry. Throughout the war, both the infantry and artillery tailored their signal organizations to meet the requirements dictated by the current situation.

This study concludes that the Signal Corps' ability to procure and train a technical force to meet the initial mobilization requirements, and then the ability to sustain that force, was marginally effective. Just as the Spanish American War demonstrated to the American Army that technical troops could not be easily created after a declaration of war, so did this war. The Office of the Chief Signal Officer initiated every action that could have reasonably been expected. However, conflicting priorities existed that had significant impact on sustaining required strength levels of the Corps; the primary contributing forces being the industrial base manpower requirements, and those of the combat arms. Only through the passage of the Selective Service Law and increased output from the the training base, military and civilian, were strength quotas met. Even given these improvements, the possibility that the Signal Corps could have met the 90,000 strength projection for men in the AEF in 1919, is questionable.

While significant achievements were made during the course of the war both in the electronic laboratories of the Signal Corps and the battlefield, the secret of its success was not its own. To combat the enemy's achievements the AEF had limited tactical communication resources, therefore we became dependent upon the French and British. The American Expeditionary Forces were "obliged" to rely solely upon the French for poles and crossarms, dry batteries, buzzerphones, switchboards, and radio and earth telegraphy sets. Without these assets the communications mission for the American Expeditionary Forces could not be fulfilled.

> ...our experience taught one great lesson that, while it stood out so prominently to the general headquarters, it is likely soon to be forgotten. That lesson is: the unprepared nation is helpless in a great war unless it can depend upon other nations to shield it while it prepares. Every scrap of the history of the AEF bears this lesson....[4]

The Allied Armies, acting as a buffer, stood between us and the enemy as we organized and equipped the American Expeditionary Forces. It appears that problems of procurement from the American industrial base during the first World War stemed from two main causes. First was the absence of a definitive schedule of requirements, and secondly a lack of knowledge regarding the capabilities and capacity of both American and foreign industry. Although industry responded quickly, demand exceeded supply. For example, very little radio material was received from the United States until after the cessation of hostilities. During the summer of 1918, it came necessary to press the French into increasing the supply of radio material because the American industial base could not respond in the time required.[5] The armistice found the United States nearing the completion of a program for the development of a series of radios especially designed to meet the requirements of our Army, but very little of this equipment had been placed in the hands of the tactical field units.

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[4]Historical Division, Department of the Army, U.S. Army in the World War, 1917-1919, 16 vols. (Washington, D.C.: Government Printing Office, 1948), vol. 14: Reports of Commander-In-Chief, A.E.F., Staff Section and Services, p. 60.

[5]American Expeditionary Forces, Report Of The Commanding General S.O.S. Commander In Chief, 3 vols. (France: American Expeditionary Forces, 1919), vol. 3: History Of the Supply Division, Signal Corps American Expeditionary Forces.

The Signal Corps: The Emergency concludes:

> The United States began and completed its role in the 1917-1918 war without reaching a development in...combat communications ... comparable to that of France or Britian....the nation's short war experience was shorter, its appropriations smaller, and to a considerable degree its industry slow to start and its research too late to be felt.[6]

The conduct of operations on the western front revealed the vulnerabilities of a war of position, and the unlikelihood of fighting a war of movement. However, General Pershing maintained a "determined insistence" to the offensive and to encourage a warfare based on movement. In 1914, doctrine specified signal communications within the infantry brigade by visual means and messengers. Wire and radio were used for transmisions over long distances; wire being designated as the primary means. The divisional field signal battalion included a wire and a radio company for this purpose. The division established wire lines to brigades; the regiment responsible for communications up to brigade and down to battalion. In 1917, the field signal battalion added an outpost company that maintained communications between regiments and brigades. The 1918 doctrine prescribed installation of "axis of liaison" by the next higher command down to and including battalions. Means of communications included panels and pyrotechics for air-ground liaison, telephone, ground telegraphy, radio, runners and pigeons.

Adoption of British publications as our model for tactical communications' doctrine, provided a strong foundation to build upon. This doctrine allowed sufficient flexibility to accomodate the judgement of the signal soldier and his leadership. It also gave thorough guidance for decentralized application and execution. But, most importantly, the leadership of the

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[6]Dulany Terrett, The Signal Corps: The Emergency (Washington, D.C.: Government Printing Office, 1956), p. 16.

Corps recognized a need for a doctrine to adequately meet the requirements of both position and movement warfare. As the role of the aeroplane increased, and the effectiveness of the infantry's offensive was tied evermore directly to its ability to coordinate indirect artillery fires, the Signal Corps responded.

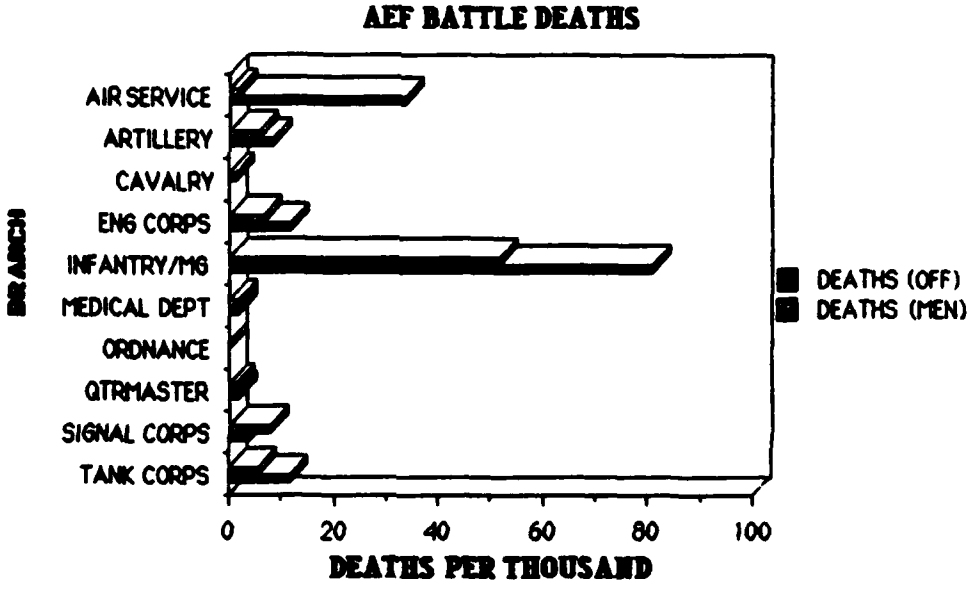
Major General George O. Squier, Chief Signal Officer during the period 1917-1923, said that the efficiency of the WWI Signal Corps should be measured against its performance under the actual test of battle and "in the military areas, which supply and maintain the combatant troops." [7] Realizing the utter unpreparedness for the character of warfare they would face, the Signal Corps quickly and efficiently responded to each challenge. Representing less than four percent of the total strength of the army, it influenced every combat action. To realize that, one may simply look at how it responded during the Second Battle of the Marne and the Meuse-Argonne Offensive. Historical research reveals that it was not a perfect Signal Corps, but rather one struggling by the strength of the individual soldier to provide a means of getting the message through.

Such was the Signal Corps entrance and exit into World War I. Thrust into an immediate requirement for the provision of soldier technicians equipped with the most current technology, and the subsequent implementation that was based on evolving doctrine, the Signal Corps found itself lacking. Technologically, organizationally and doctrinally it matured as it responded to the changing conditions of war, but at a great cost of both men and material.

[7] Ibid., p. 11.

THE COST

Second only to the Infantry[8], the Signal Corps' casualty list contained 2,840 names. Statistics reflect 179 killed in action, 112 died of wounds received in action, and ten others died of gas received in action. The remainder of the list included 458 severely wounded and 707 slightly wounded in action, 41 severly gassed, 350 slightly gassed and 165 gassed to an undetermined degree. The remaining 27 died of disease or were accidentally killed.[9]



SOURCE: Battle deaths among each thousand officers and men who reached France. From "The War with Germany, a Statistical Summary" (Ayers) 2nd Edition.

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[8] Second only to the infantry if the Signal Corps battle casualty figures include Aviation losses during the period Aviation was an integral part of the Signal Corps.

[9] War Department, Office of the Chief Signal Officer, Report Of The Chief Signal Officer To The Secretary Of War 1919 (Washington, D.C.: Government Printing Office, 1919), p. 524.

an official compilation prepared by the Statictics Branch of the General Staff, War Department, Washington, D.C.

THE APPLICATION

> **The execution of the air-land battle doctrine requires the skillful use of resources....a responsive communications sytem is a must. The communications requirements will create some new challenges for communicators....The objective of the combat communicator must be to maintain communications under all conditions. Commanders and combat communicators must realize without communications there will be no command and control on the battlefield.**[10]

It is not my intention to state that lessons learned from World War I have direct application to tommorrow's air-land battlefield. I am confident in saying however, it is well worth considering the similiarities between the impact of technology on the Army of 1917 and the Army of 1987. The goal for all tactical communication systems is simplicity. Yet, the complexities of the battlefield mandate a communications systems' technology that rival the mind and the given abilities of the individual soldier.

The lessons learned by the World War I Signal Corps may play into the next conflict to an extent greater than we can imagine. Raising, training and sustaining a technical force will be no less difficult. Neither will the employment of evolving doctrine based on our revolutionary changes in technology.

The gravity of the next battlefield demands that when we engage the enemy, we are successful the first time. The ability to provide timely and effective command and control communications will be the essential ingredient for that success. There will be no margin for error. The Signal Corps

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[10]Headquarters Department Of The Army, FM-24-1 Combat Communications (Washington, D.C.: Government Printing Office, 1985), pp. 1-5 through 1-6

must ensure it is prepared to respond with multiple communication transmission means when required - for the opportunity may come only once.

APPENDIX A

Annex No. 5 ,The Signal Annex, to Field Orders No. 7, 3d Division, 2 July 1918, relating to Signal Communications for the Defense of the Sector

ANNEX NO. 5, to F.O. No. 7.
PLAN OF LIAISON

1. **LIAISON AGENTS.**

(a) The following officers are detailed as liaison agents:

.....

(b) Brigade Commanders will provide liaison between units and P.Cs. under their command, and neighboring units.

(c) Commanding Officer, Divisional Reserve, will provide one N.C.O. and two privates to be attached to Division P.C.

2. **COMBAT LIAISON.**

(a) Combat liaison with neighboring divisions will be established and maintained as prescribed in F.O. No. 7.

(b) The mission of these groups is to inform neighboring units as to events on their flanks and to act as flank guards in case of enemy penetration.

(c) Communication by runner will be obtained and permanent runner posts established. Sketch showing runner routes will be forwarded to these headquarters.

(d) Subsector commanders of the BLESMES and CHARTEVES subsectors will be responsible for the proper functioning of these groups.

3. **LIAISON BY TELEPHONE.**

(a) For list of Code Calls see Table I. (Not attached).

(b) Division Signal Officer will run the necessary lines to connect each P.C. with higher and neighboring P.Cs. and to duplicate the connections between Infantry and Artillery Nets.

(c) Sketch will be submitted by Division Signal Officer showing location of all lines.

4. **LIAISON BY VISUAL SIGNALS.**

(a) Each unit commander will provide for stations and relay posts to enable him to communicate by visual signalling with units in his rear.

(b) Lateral communication by visual signals will be established in all cases where signals cannot be observed by the enemy.

(c) Visual signals will be employed from rear to front only at points where the rear post is shielded from enemy observation. The following signals will be used by the rear stations:

Understood.....2 stars (35 mm. pistol)

Repeat..... 1 star (35 mm. pistol)

(d) All visual connections will be established by midnight July 4th, 1918.

5. **LIAISON BY T.P.S. AND T.S.F.**

(a) Operators will transmit by T.P.S. and T.S.F. messages in code only. They will not accept for transmission any messages in clear.

(b) For indicatives of radio stations, see Table II. (Not attached).

(c) For Code, see Table III, or Code Series 60 (Table ROSSIGNOL), for use in the transmission of messages. (Not attached).

(d) For Conventional Symbols see Table VII, completed for coordinates by Key No. 321. (Not attached).

6. **LIAISON FOR RUNNERS.**

(a) All unit commanders will establish liaison by runners and relay posts to provide communication with the next higher unit, units on the right, and the supporting artillery. (Division will provide runner lines to Brigade P.Cs.)

(b) Except in cases of emergency, runner lines will not be manned unless so ordered.

(c) Sketches showing lines prescribed and the strength and location of relay posts will be furnished these headquarters.

(d) Runner line between Division P.C. and the Division Reserve will be established by Commanding Officer, Headquarters Troop (using both mounted and dismounted men as circumstances may require).

7. **LIAISON BY FIREWORKS.**

(a) For signal to be made by fireworks, see Table IV. (Not attached).

(b) Firework signals to be made by Infantry command plane are prescribed in Table V. (Not attached).

(c) Telephone will always be used in preference to fireworks.

8. **LIAISON BY PIGEONS.**

(a) Location dovecote:...Northeast of Viffort.

(b) Distribution of pigeons will be determined by Division Signal Officer in accordance with later instructions.

NOTE. - Pigeon messages from front line to Division P.C. should require about 20 minutes.

9. **AERIAL LIAISON.**

(a) Distinctive sign,Infantry command plane - 2 pennons from right wing.

(b) Distinctive sign, Division Balloon - 2 pennons on upper part of cable and one pennon behind balloon.

(c) Panel code for the use of the Division is prescribed in Table VI. (Not attached).

(d) Message-dropping stations will be selected by Brigade and Regimental Commanders, and their exact location furnished this P.C.

(e) Each P.C. will have on duty at all times a team to watch for the Command plane and to display panels at proper lines.

10. Division Signal Officer will submit sketches showing positions of all telephone lines, radio and visual stations, and all connections with neighboring divisions.

11. Artillery net will be established under direction of D.A.C. Additional lines will be run by the Infantry under the direction of Division Signal Officer to connect this net with Infantry system.

12. P.C....

13. Each Battalion Commander will forward to this P.C. through Brigade Commander a sketch showing distribution of his troops in detail, location of all P.Cs. by coordinates, and all liaisons. Each, unit commander will be held responsible that communication is maintained at all times, by all methods and that liaisons are tested each day

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NOTE 1. - All T.S.F. messages from Regiments to points in rear of Brig. P.C. will be repeated by their own Brigades either by telephone or T.S.F.

NOTE 2. - All station calls belong to the sector P.C. and not to regiments. When units change their location incoming units will use station calls of the sector.

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TABLE 1 (Corrected to 5 July, 1918), gives code names for all units with which the division might communicate, uses a numerical code for staff officers and commanding officer at different headquarters, these not having the same meanings at different headquarters, adds code names of towns and farms in the sector, and concludes with the note: Battalion Commanders will provide code names for units within their command. JDBL

3d Div.
France, 6 July, 1918

APPENDIX B

The following is an extract from an Army Service Schools' publication entitled Instructions For Training A Division For Offensive Action, American Expeditionary Forces. Its content reflects how the A.E.F. should train based on experience gained in actual communication systems' employment during combat. (Allies and America's). It transcended theory, therefore providing the United States a firm training plan for preparing soldiers for OFFENSIVE combat in France.

INSTRUCTIONS FOR THE TRAINING OF DIVISIONS FOR OFFENSIVE ACTION

XI.-SIGNAL COMMUNICATIONS

1. The rapid establishment of good signal communications, immediately after the assault, is one of the most important, though one of the most difficult, things to be dealt with. No possible means of keeping up communications must be neglected.

The O.C. Signals of the Division must be kept informed of all projected moves and operations, and should attend all staff conferences which concern operations.

Particular attention to the subject during training and careful preparation before the assault are the best means for ensuring success.

Consideration of topography and the siting of our own and hostile trenches will decide the methods which give most promise of success, and of these methods every effort should be concentrated. The parties required for establishing each system must be definitely told off and properly organized beforehand, and should be trained to their particular duties at all rehearsals.

2. ***Cable lines for telegraph and telephones.***-

(i) This is the most valuable form of communications, and every effort must be made to establish the lines securely at the earliest possible moment. To render cable lines reasonably secured requires time and labor, and can be only effected by burying them to a depth of six feet or more.

(ii) The extend to which hastily-laid lines on the surface can be kept through depends on the amount of hostile shelling.

Laddered lines are very useful, and can be quickly constructed after the assault.

The vicinity of villages, wooods, and roads, which are always heavily shelled, should be avoided as far as possible when selecting cable routes.

Communication trenches in the enemy's line, which will not be required for consolidation, should be previously selected

and alloted as cable trenches; the cable can be buried in these, when labor is available, in less time than would be required to dig a new cable trench. The latter is more likely to be noticed than the old communication trench is likely to have dugouts in it which can be used for test points.

(iii) Cables must be run out immediately behind the last wave of the assaulting column, the linemen following a previously selected route; the cable should be carried right through to the trench which is being consolidated, and offices established at points in this trench line which have been previously selected after studying maps and air photographs.

(iv) As soon as this has been done, efforts must be concentrated on the maintenance of one or two lines leading to important points; it is a waste of time and labor attempting to maintain all the lines. Existing dugouts in the enemy trenches must be told off as test stations on the cable route, and maintenance parties, previously detailed, must be stationed at these test stations.

(v) Special working parties must be placed at the disposal of the O C Divisional Signal Company for the purpose of burying the cable across No Man's Land, and thence forward, via old communication trenches, to the consolidated line. These parties will seldom be able to start work before the night after the assault.

(vi) Where Russian saps have been run out, it may be possible to get the cable part of the way across No Man's Land, before the assault, by laying the cable at the bottom of the sap; then, when the roof of the sap is broken in, the cable will be buried sufficiently to protect it from shrapnel, and also from traffic in the sap.

3. ***Visual.***-

(i) Where the topography of the ground is suitable good results can be obtained with visual.

This system depends more than any other on previous preparation; all details must be worked out, points where it is proposed to establish stations in the enemy's lines being approximately located by reconnaissance and by the study of maps. In this connection, enemy machine-gun emplacements have been found valuable. When completed, the scheme, with a sketch map, must be issued to all concerned.

Back stations in our own lines must be specially prepared and provided with overhead cover.

(ii) A selected Officer, either of the Signal Service or an Officer in charge of Battalion Signals should be placed in charge of the organization, and he should be given the N.C.O.'s, Signallers, and the equipment required to work the scheme. It will usually be necessary to call on Battalions to find the necessary personnel

(iii) Each signal station, to be established in the enemy's lines, should be allotted to a definite Battalion. The personnel detailed for each station will assemble at the Battalion Headquarters, prior to the assault, and will be sent forward by the Battalion Commander as soon as the objective has been gained. They should not be sent over with the assaulting columns.

The personnel should be lightly equipped; they must carry the signaling equipment fastened to the person in as inconspicuous a manner as possible, while yet leaving them free to use their weapons if necessary.

(iv) The signallers of assaulting Companies move with the Company Commander, and should carry signalling shutters for the purpose of getting into communication with their own unit as soon as the objective has been reached,, and before the main visual scheme has been established.

Lamps should be reserved for the main scheme; they are too bulky to be carried in the assault and also are difficult to replace.

(v) All visual signallers need special training to give them confidence in repeating a message several times to a known back station which may not be able to reply forward; it is most desirable, however, that the back station should acknowledge whenever possible.

4. ***Pigeons.*** - These are invaluable when properly organized and used. Attention is drawn to "Notes on the Use of Carrier Pigeons," S.S. 123.

The pigeons and personnel available must be definitely allotted to the different units; and arrangements must be made for maintaining the supply of pigeons.

At the commencement of the assault the pigeons and pigeon men must be kept back at Battalion Headquarters, and sent forward as soon as the position has been gained. The men must be given definite orders as to whom they are to report to, and must be provided with a guide if necessary.

In the front, pigeons must be kept in dugouts to protect them from shell fire, mud and wet, as much as possible.

Pigeons should be reserved for important messages; all Officers should be instructed how to write clear and concise messages in the Pigeon Message Book.

5. ***Wireless.*** - Attention is called to "Notes on Wireless," S.S. 100.

(i) A wireless set, placed at the disposal of a Division by the Corps, must be allotted to a definite Commander, or to a specially-appointed Officer, who will be responsible for deciding what messages are to be sent by wireless, and for arranging for the messages to be coded.

(ii) Wireless should be reserved for urgent messages, such as calls for barrage fire, ect.; the messages must be short and concise, to facilitate coding and decoding.

(iii) At the commencement of an assault a wireless set should not, as a rule, be in advance of Brigade Headquarters; but as soon as the position has been gained, a wireless set should be sent forward to a selected Battalion Headquarters, or to a selected position if the site of Battalion Headquarters is not suitable.

(iv) A Commander ordering a wireless set to move forward will arrange for:-

(a) Written orders as to whom the party are to report to, and at whose disposal the set is to be placed.

(b) A carrying party of six men.

(c) A guide to the new position.

(v) As far as possible, the points to which the wireless sets are to move forward must be decided on before the assault and notified to all Commanders concerned; otherwise the latter will be unaware of the existence of wireless communication in the forward area, and will consequently not make use of it.

(vi) It is impossible to obtain good results from the delicate wireless instruments unless the set is installed in a reasonably dry dugout, which should be reserved for wireless only. Heavily-shelled areas must be avoided, otherwise the difficulty of maintaining the aerial may render the set useless.

6. ***Earth Induction Sets.***-Some of these sets may also be placed at the disposal of a Division by the Corps.

The same conditions as laid down for wireless apply to the use of these sets.

The forward stations, which can send only, will usually be worked by Battalion Signallers, who must be specially trained in the use of the Power Buzzer which is employed.

The back stations will be worked by the Corps Wireless personnel; dug-out accommodation near the head of the buried cable will be required for these stations.

7. ***Runners.***-This is the one only means of communication which can be relied on when all other means fail; and, therefore, Commanders must devote great care to the training and organization of their runners. Company runners must be trained with their Companies.

Opinions vary as to the actual number required; the following has been found to be a good average number:-

At Battalion Headquarters, 10 men; 2 of these are detailed particularly as Brigade Runners, and 2 from each Company to work primarily, but not solely, between their own Company and Battalion Headquarters.

At Company Headquarters, 4 men.

Each Platoon Commander also requires a Runner; his servant is the most satisfactory man.

Runners should be lightly equipped and should wear a distinctive mark; they should be young, lightly built, and intelligent. Every man must be thoroughly familiar will *all* the routes to all the principal centers within their Battalion sectors, i.e., to *all* Company Headquarters, and not only to their own, to *all* forward dumps, to the Headquarters of Battalions on the flanks, to the Headquarters of the Brigade and to the advanced Report Center.

It must be impressed upon all runners that the quicker they go the safer they are.

Company and Platoon Runners must go forward with their perspective Commanders.

Runners must be sent in turn and must be rested as far as possible when not actually at work. A small supply of rum should be kept for them when the work is hard.

Where messages have to be carried a long distance, *e. g.*, to Brigades, some arrangement of relays is required. The establishment of a Brigade Advance Report Center well forward, at the head of the buried cable, if existing, is useful; a N.C.O. of the Brigade Signal Section, should be in charge there. Battalion Runners will bring their messages to this point, whence the contents can be telephoned to Brigade Headquarters, the actual messages themselves being sent on by special Brigade Runners.

Relay posts may often be required between Brigade Headquarters and Advanced Divisional Headquarters, or perhaps between the reserve Brigade Headquarters and Headquarters of Brigades in front line. Every relay post must be labelled and numbered.

Mounted orderlies are also useful for communication between Advanced Divisional Headquarters and Brigade Headquarters; a troop of Corps Cavalry, if available, is most useful for this work.

On no account should any verbal messages be sent by runners; every message must be in writing. Verbal messages should generally be ignored.

8. ***Artillery Messages.***-Company and Battalion Commanders of assaulting units must be prepare to assist F.O.O.'S and Artillery Liaison Officers in getting their messages back.

The Artillery cannot always provide sufficient runners for their forward Officers; and, where it is not possible to keep a line open owing to shelling, an Infantry runner will often be the only means of getting an Artillery message through.

There must be the closest co-operation between the Signal Service of the Division and the Artillery as regards the transmission of Artillery Messages; and, in deciding on the means of communication to be established, the needs of the Artillery must be considered and provided for as far as possible, particularly in the buried cable routes forward from our jumping-off trenches.

9. ***Accommodation for Signal Personnel.***-The efficient working and maintenance of communications depends largely on the accommodation available for the personnel engaged in working them.

Commanders must not forget this point when establishing Headquarters in a captured position. If Signallers, Pigeon Men, Wireless Operators and runners are all crowded in one small dugout, it is difficult for them to maintain good communications.

This extract is also from Instructions For The Training Of Divisions For Offensive Action.

APPENDIX A (PREPARATORY MEASURES TO BE TAKEN BY A DIVISION FOR AN ATTACK FROM TRENCHES)

1. ***Reconnaissance....***
2. ***Artillery Preparation....***
3. ***Organization of Trenches for the Attack....***
4. ***Observation Posts....***
5. ***Command Posts....***
6. ***Signal Service.*** - (i) the establishment of the Signal System, *i.e.*, Telegraph and Telephone, will be co-ordinated (sic) as a whole by the Corps.

The Divisional Commander must make himself acquainted with the scheme and satisfy himself that it meets with his requirements.

The principle points which require attention are:-

(a) Cable communication, buried 6 feet deep, must exist between the Divisional Command post and the front trenches.

(b) All Artillery and Infantry Command posts, and observation posts in the area between the Divisional Command Post and the front trenches, must be linked up with the buried system. Command Posts on the flanks of the area must also be linked up with the buried systems of formations on the flanks.

(c) All wires in communication trenches must be securely fastened and must not be allowed to interfere with traffic in any way.

(d) Where time is short, commence burying cable at the front line trench and work backwards....

(ii) The Visual Signalling Scheme must be worked out, and sites for stations both in our own and in the enemy's lines selected.

When prepared, the scheme should be issued, in the form of a diagram, down to Battalion and Battery Commanders.

If time permits, good value will be obtained by making receiving and transmitting stations, within our own lines, shell-proof.

7. ***Employment of R.E. and Pioneers....***
8. ***Formation of Store Depots or Dumps....***
9. ***Police Arrangements and Traffic Control....***
10. ***Medical Arrangements....***

APPENDIX C

The following is a list of the more important communication developments in the American Expeditionary Forces of The Signal Corps. More specific detail is provided on selected equipment. These developments are the result of the efforts of the Research Section, Division of Research and Inspection, and members of the Engineeing Division, Office of The Chief Signal Officer.

Miscellaneous Telephone Apparatus
- Camp Telephone Switchboard
- Redesign 4-line Monochord Switchboard
- Combination Test Set for Field Use
- Cable Splicing Kit
- Sager High-Wire Device
- Anti-Aircraft Artillery Telephone Set

Two-Way T.P.S. Set
Mobile Telegraph Office
Mobile Telephone Office
French Reel Carrier
Constant Frequency Radio Set
Two-Way Radio Loop Set
Listening Station System
Shell Fire Wire Clip
Radio Tractors
Tank Radio Set
Non-Communication Apparatus Developments
- Chilowsky Shell
- Gun Sight Lighting Device

Miscellaneous Telephone Apparatus.

The A.E.F. Research and Development Division's laboratories pursed the following developments : Redesign Camp Telephone Switchboard, Redesign 4-line Monocord Switchboard, Combination Test Set for Field Use, Cable Splicing Kit, Sager High-Wire device, and an Anti-Aircraft Artillery Telephone Set. In several cases, quantity production had begun when a signing of the armistice ended the work.

Two-Way T.P.S. Set.

Developed in February, 1918, the first model of a compact, portable, two-way T.P.S. Set provided satisfactory service at the front beginning in July, 1918. The final model, the S.C.R. 76-A was arriving in France in quantity by the signing of the armistice.

Mobile Telegraph Office.

Installed in a large autmobile trailer, it contained equipment for six operators a clerk. It capability of a ten telegraph line terminal capacity, combined with expansion potential, provided the Headquarters of the First Army with excellent telegraph service by August 1918. Prior to the signing of the armistice, the Signal Officer of the First Army ordered two others.

Mobile Telephone Office.

A development similiar to the preceding one. Designed to handled the telephone load of an army headquarters, it consisted of a mobile telephone office with terminal facilities for 180 lines. First Army rceived delivery of the first and only one on September 19, 1918.

French Reel Carrier.

Intended to replace the French Derouleuse which was not entirely adaptable to trench use, it transported the standard French and American field wire reels. Manufactured in France, front line organizations received them as rapidily as possible.

Constant Frequency Radio Set.

Developed for communicating over distances up to 200 kilometers, this apparatus used the same transmitting circuit designed for the Tank Radio Set. It rendered effective service in the rear network extending from Spa to Chaumont, France.

Two-Way Radio Loop Set.

Using a loop one meter square for the antenna, with a ten kilometer range, this was a portable two-way quenched spark radio set for communications between advance units. Successfully demonstrated to First and Second Divisions' signal officers in August, 1918, the models were sent back with a signal representative from the American Expeditionary Force authorized to put the set "on a production basis with the least possible delay. Although production began in September,1918, none were received in France prior to the signing of the armistice.

Listening Station System.

Initially the AEF employed the French 3-ter amplifer. However, by the time hostilities ceased, all American controlled listening stations used American designed and manufactured equipment. The basic component of the system was the S.C.R. 72 amplifier. The system, which employed the use of a number earthed antennas, the S.C.R. 72 amplifier, and a low intensity filter, was the result of several months of experimental work both in the research laboratories of the AEF and at the front.

Shell Fire Wire Clip.

This clip facilitated the rapid splicing of field wire without the necessity of removing the insulation. It consisted of a medal plate studded with sharp metallic points arranged so that when the two ends of the plate were squeezed together over the wire to be spliced, the points pierced the insulation and made permanent contact between the wires. Field testing proved successful and 2500 were subsequently locally manufactured and distributed to the front line units.

Radio Tractors.

The A.E.F. Radio Division mounted Type E-3 and E-10-bis radio equipment on modified Fiat trucks beginning in September, 1918. These movable radio stations received satisfactory performance comments while employed in the First Army system.

Tank Radio Set.

The set employed an umbrella antenna six feet high with four arms four feet long, and a special undampt wave transmitting circuit which had the important advantage that the wave-length was controlled by the constants of an internal circuit and in no way depended on the antenna constants. After successful field tests, the Tank Corps planned for their employment in the Meuse-Argonne offensive. Production began in October,1918, but the signing of the Armistice occurred before completion of the sets. Field testing in the 5 December, 1918 maneuvers resulted in satisfactory performance.

Non-Communication Apparatus Developments.

Chilowsky Shell.

The French with the assistance of two American signal officer conducted the research. The essence of the idea consisted in providing in front of the shell a heat source that would reduce air density, thereby

increasing the velocity of the shell. Research results showed increased velocity and stabilty of sheel in flight. No definite results in the form of shells for field use had been achieved when the Armistice went into effect.

Gun Sight Lighting Device.

Developed and manufactured at the Laboratories of the Research and Inspection Division, A.E.F., it illuminated for night shooting the cross lines on the collimator of the 75mm field gun and the 150 mm Howitzer. The device proved to be so successful that a quantity sufficient to equip fourty-eight divisions was manufactured.

SOURCE: War Department, Office of the Chief Signal Officer, Report of the Chief Signal Officer To The Secretary Of War 1919 (Washington D.C.: Government Printing Office, 1919), pp. 282-299.

APPENDIX D

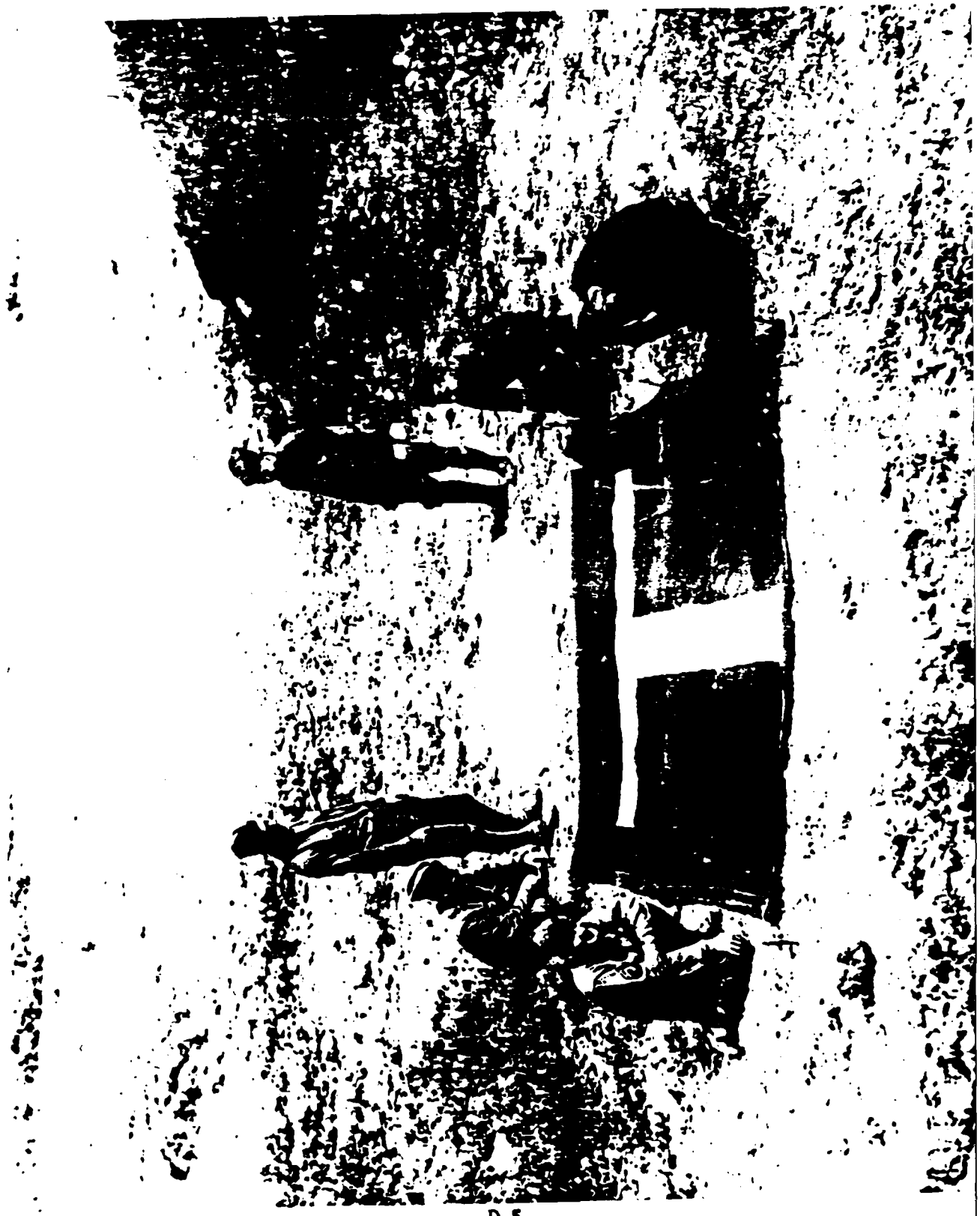
Picture Page D-2. "U. S. Army Photograph." The crossroads in the Argonne woods, near Montfaucon, Meuse, France showing an important switchboard, placed there by the 112th Field Signal Battalion, during the advance through the woods. This board is a vital spot in the means of communication. The lines connecting the regiments with division headquarters and division headquarters with corps headquarters meet at this point. During an emergency, when all the men were out "shooting trouble," Second Lieutenant Edward E. Fernch, of the 52nd Telegraph Battalion, acted in the capacity of operator. Headquarters, 32nd Division. 2 October 1918.

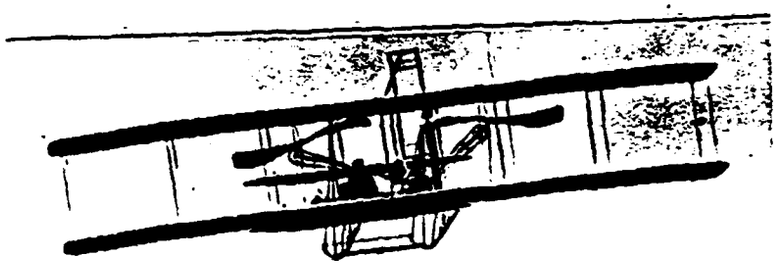
Picture Page D-3. " U. S. Army Photograph." Sergeant First Class G. F. Scott. 305th Field Signal Battalion, 80th Division, using Lucas Lamp. This lamp replaced the heliograph used in previous wars as a means of visual signalling both day and night. Private J. M. Heil, 318th Headquarters Company, with note book, and Private Joe Lavini, 305th Field Signal Battalion, with gun protecting them. Pretz en Argonne, Meuse, France. 22 October 1918.

Picture Page D-4. "U. S. Army Photograph." (National Archives). The A.E.F. possessed but a fraction of the carrier pigeon potential which the Allied Forces could toss aloft - no more than 6,000 birds, or 1/5th of the overall feathered fleet.

Picture Page D-5. "U. S. Army Photograph." The Paphan panel system was for visual aeroplane signalling. Here the round white cloth identifies the sender with the black stripe telling the Division. The white letter "T" is an all-clear sign, signifying that there are no messages for the aeroplane.

Picture Page D-6. "U. S. Army Photograph." (Signal Corps Photograph Collection). President Woodrow Wilson talks to an aeroplane pilot over an wireless telephone. Washington, D.C. 21 November 1918.





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LTC Truedell provides a very candid evaluation. Of the three lectures listed in this bibliography, it is the most informative. Without it, a different conclusion to the signal soldier's effectiveness might be reached.

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